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VIEWS, NEWS AND INTERVIEWS.

A prominent consulting electrical engineer in New York city heard that an electric lighting plant was to be installed in Sing Sing prison and wrote to his friend, Warden Sage, offering his services to supervise the installation. In reply, Warden Sage wrote as follows:

The work we have already done, and this work which we propose to do, I find, can be taken care of by Captain Hilbert, who has charge of the machinery in this prison, with the help we are able to get from the electrical experts that we find among our prison population.

And yet it is still said that electricity "is in its infancy."

General Traveling Agent Stone, of the Georgia Southern Railroad, told a Georgia man recently that he had discovered an electrical process for converting wood into stone. He could, he said, petrify wood at a moment's notice, and he proposed to make a fortune by converting the plank walks, common in Southern cities, into stone pavements. He also said that there ought to be lots of money in turning frame buildings into stone houses. His statement was printed in some of the newspapers, and now Mr. Stone is kept busy telling his friends that he was only joking.

A Boston man interested in electrical work is quoted as saying that "there is now enough second-hand cable that has been taken out of street car systems where the trolley has replaced the cable to make an entire cable system for the city of Boston, and that it can be had cheap."

History records several instances where needy and unprincipled persons are alleged to have stolen red-hot stoves, but it isn't often any one is found with sufficient nerve to steal copper wire from a live arc circuit. Such a case was recently reported from Newark, N. J. One thief was shocked while cutting wires on a pole. He fell off the pole and was killed. His companion took his watch and ran away but was caught later. The wire thieves were in the habit of hiring a horse and wagon from a livery stable night after night and chalking upon the side of the wagon: "Newark Electric Light and Power Company." They destroyed whole circuits by cutting the heavy copper conductors, thus putting out lights in various parts of the city night after night. It is supposed that they sold the copper to junk men.

The Compania Anomina La Electricidad, of Caracas, Venezuela, proposes to develop power from two falls in the El Guaire River and transmit it to Caracas. One of the falls is 120 feet high and will give about 1,000 horse-power. The other is 225 feet high and will develop about 2,000 horse-power.

Captain-General Weyler has taken charge of the Spanish forces in Cuba, and has issued several proclamations which show that he is still entitled to his old nickname of the "butcher." Any one offending the conditions of these proclamations is brought by summary proceedings under military jurisdiction and is tried by court martial. The penalty is mainly death. It is reported that 24 political prisoners have already been shot in the Cabanas. Among the proclamations is one containing the following sections, any offense of which subjects the person in question to the penalty named above: "Any one who destroys or damages railroads, telegraphs or telephones, or who interrupts their operations; telegraph operators who deliver war messages to other persons than the proper officers."

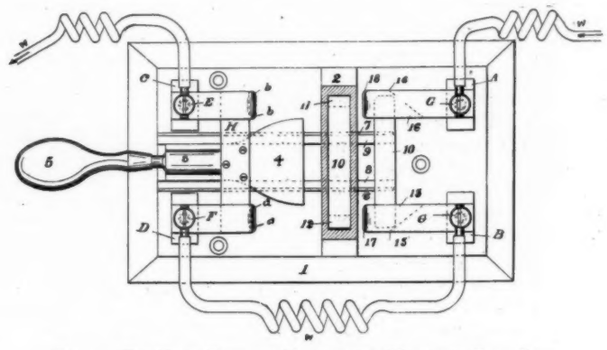


FIG. 1.—TOP PLAN VIEW OF HIEATZMAN'S MAGAZINE FUSE BOX AND KNIFE-SWITCH.

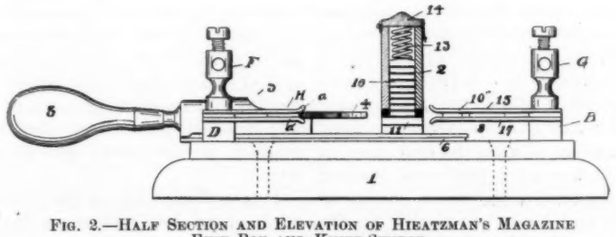


FIG. 2.—HALF SECTION AND ELEVATION OF HIEATZMAN'S MAGAZINE FUSE BOX AND KNIFE-SWITCH.

KIND WORDS.

AT THE TOP OF THE SCALE.

TO THE EDITOR OF ELECTRICAL REVIEW:

Please accept my praise of your valuable paper. It ranks as one of the first of its class.

Yours truly, C. E. L.

Oakland, Cal., Feb. 12.

The Hieatzman Magazine Fuse Box and Knife-Switch.

Quite a novelty in electric apparatus whereby, it is claimed, a great saving of time, labor and money is obtained, is brought out in the Hieatzman magazine fuse box and knife-switch, which is sufficiently shown in the illustrations herewith to be readily understood. For general use a modification of this form will be constructed that will operate with even greater practical results; *i. e.*, a centrifugal, instead of a reciprocating, movement of the handle will be employed, as contacts can be more instantaneously made and broken with such construction. Fig. 1 is a top plan view. Fig. 2 is a view in elevation, part half sectional.

Referring to the illustrations: 1 is a base block of any suitable non conducting material. The terminals A G, B G', D F and C E are fastened, one at each corner, thereto. 2 is the magazine fuse box, the plunger block 3 with its extending blade 4 and operated by the handle 5 has a reciprocating movement in the grooves 6 and 7, which are formed by the rabbets 8 and 9. On the top of the plunger block 3 is also fastened the switch-blade H.

The magazine box 2 has studs or small inward projections 11 and 12, which keep the fuses 10 from passing straight through, and with the concert action of the spring 13 hold the fuses 10 always in position. *a a'*, *b b'*, 15, 17 and 16, 18 are the fingers of the various terminals to which they are affixed. The fingers 17 and 18 are constructed with projections 15' and 16' on their inner sides.

The operation of the device is extremely simple and can be readily understood. With the switch-blade H and the fuse 10' in position between their respective terminals, the circuit is closed and the flow of the current is uninterrupted. Should the fuse "blow," thereby breaking the circuit, the insertion of another fuse is accomplished in the following simple manner: Push the handle in, which at the same time moves the plunger block forward. This movement withdraws the switch-blade from

between its terminal fingers; the extending blade strikes the lowest fuse within the magazine box and moves it forward into position between the fingers of the respective terminals for its reception. The end or ends of the burnt fuse are also at the same time by this movement forced from the terminals by the angles on the inside projections of the terminal fingers 17 and 18. Withdrawing the handle again sharply brings the switch-blade back into position—in contact with its respective terminals—thereby completing the circuit again, and accomplishing in five seconds, it is claimed, that which with apparatus now in vogue requires from five to ten minutes.

The magazine fuse box is not necessarily an adjunct of the knife-switch. It is independently operative with any kind of switch.

Electricity on the Brooklyn Bridge.

If the present method of using electric motor cars on the New York & Brooklyn Bridge for switching trains should prove economical as well as satisfactory, a certain number of cars will be equipped with four motors, one on each axle. These cars are to be known as motor cars and each will remain with its own train at all times, switching it from the incoming to the outgoing tracks and pulling or pushing it over the tilting sheaves, when the grips will take up the cable and the motors cease work. Should the grips slip while the train is mounting the 3.78 grade, the motors can come again into requisition and assist the trains over the summit.

Electric Eels Cause Fire!

A water-boat, the "Fred. H. Grove," caught fire the other night just north of Fulton Ferry, New York city. The city fire department extinguished the flames by filling her hold with water. When the fire was out the fire-boat "Zophar Mills" rushed up, and as there was nothing else to do, proceeded to pump out of the "Grove's" hold the water the land engines had pumped in. There was nobody aboard the "Grove" when the fire started, and the only explanation of the origin of the fire that the police could obtain came from an elderly seaman, who said: "An electric eel was caught in her feed pipe."

PERSONAL.

Mr. Henry B. Cutter, of the Cutter Electrical and Manufacturing Company, Philadelphia, visited New York city last week.

Mr. J. H. Reid, of Chicago, general sales agent for the Westinghouse Glass Factory, Pittsburgh, was among the visitors to New York city last week.

Mr. Paul W. Bossart, assistant general manager of the American Electric Telephone Company, Kokomo, Ind., visited the metropolis last week.

HEAT FROM ELECTRICITY.

BY J. E. TALBOT.

In considering the questions suggested by the above title, one is at once struck by the apparent vagueness and want of definition in the requirements and applications of the electrical transference of energy as used for heating purposes; this, however, appears to be a vagueness due to other sources than the particular method of conveying or producing the heat form of energy at a particular point. It would probably puzzle most engineers to decide how many pounds of coal are required to cook a beefsteak or to roast a turkey, largely for the reason that, although the actual net thermal units needed might be arrived at with some degree of approximation, yet the *fuel* required (the ultimate basis for the determination of cost) would be a matter of conjecture, owing to the fact that by far the larger portion of it is simply *wasted*, unless, indeed, the cooking apparatus is also utilized for purposes of heating. In fact, it seems to have been pretty clearly shown that the ordinary cooking stove has an efficiency of not more than from two to four per cent.

Therefore, it appears that the electrical method of conveying the thermal energy of fuel burned under a steam boiler, by means of an engine, dynamo and copper conductors, to a given point, is required to compete with a system admittedly inefficient. The losses incident to steam production are undoubtedly very considerable, but it is believed that with good steam and dynamo practice nearly 10 per cent of the theoretical energy of the fuel consumed can be delivered from the dynamo in the form of electric current. A considerable margin, therefore, remains for work, over and above any losses in distribution and conversion, leaving altogether on one side the considerations of safety, cleanliness and convenience. The two principal forms of application of the electric current for the production of heat, viz., *cooking*, and *air heating*, must be regarded from different points of view. The problems involved are different, though the primary means employed—the forcing of current through an imperfect conductor—are in principle similar.

In the case of cooking, the heat is concentrated and confined to a point "where it will do the most good," and restricted to its specific purpose, as contrasted with the coal stove, in which the larger portion of the heat is, practically, wasted on masses of iron and brick, or carried up the chimney by air currents. In the heating of apartments, on the other hand, in which case the heating is frequently combined with ventilation (our experience being mostly derived from steam heating), the effectiveness depends on the rapidity of dissipation of the heat generated, either by radiation to surrounding objects or by, and most largely so, connection, by means of currents of air passing over the heated surface, the amount of which depends on a variety of surrounding conditions, which furnish "a complex thermo-dynamical and hydro-dynamical problem, which has only been reduced to quantitative results in a very few cases."—Houston & Kennelly.

Considering, now, the question of cooking somewhat more in detail, the electrical method offers some advantages in the way of measurement of the energy required to produce a desired result that are not applicable to coal combustion in a common cooking stove. In the first place, in a piece of electric-cooking apparatus, the larger proportion of the energy applied is actually utilized, and but little lost in useless radiation; again, what energy is applied can be readily and exactly measured, and its cost is readily ascertainable.

For example, assuming a case where electric energy is purchased from a central station system of supply at a given rate, say eight cents per kilowatt hour, the usual unit, the following table gives the temperatures and costs in heating one pound (about one pint) of water in a tea table kettle.

Time. Minutes.	Kilowatt Hour.	Cost at 8 cents.	Temperature Fahrenheit.
0	0	0	50°
10	0.075	0.64	212°

Similar determinations can be made in the case of heating apparatus. Thus, to heat a given form of radiator plate,

Time. Minutes.	Kilowatt Hour.	Cost at 8 cents.	Temperature Fahrenheit.
0	0	0	50°
10	0.091	0.728	171°
30	0.277	2.200	240°
40	0.350	2.800	257°
50	0.430	3.440	261°
60	0.500	4.000	264°

Now, in the case of a coal stove, and starting from the temperature of the surrounding air, the heat necessary to perform the work required in the first case referred to would manifestly require the consumption of more than three pounds of coal (the amount which 64 cents would purchase at the average price of stove coal), to say nothing of the saving in labor and convenience. In the particular instance cited then, as an actual matter of dollars and cents, the advantage is on the side of electricity. It is not to be supposed, of course, that in Winter a coal stove would be lighted every time a pint of hot water is needed, but, *per contra*, our experience tells us that tons upon tons of coal are wasted in Summer in heating not only our kitchens to an unendurable point, but also the tempers of our cooks and housewives.

It is probable that, as the cooking stove in practice performs a double function, and that, therefore, the superfluous heat in Winter is not absolutely wasted, the demand for current for cooking purposes will be larger in Summer than in Winter, a favorable condition from the point of view of the central station, as during the Summer months the demand for current for lighting purposes falls off. It is not unreasonable to suppose that for some time the antipathy to innovations of any kind will retard the adoption of the electric-cooking stove or oven, or the electric boiler, except as a luxury; when, however, the lowering of rates and familiarity with the convenience of electrical appliances of this nature have educated the general public in their advantages, they will undoubtedly be more and more used.

Some criticism may perhaps be made as to the rate for current referred to above (eight cents per kilowatt hour), especially bearing in mind that the average meter rate for current for incandescent light is about 20 cents per kilowatt hour. At this present writing probably in not many cities could such a rate as eight cents be obtained, but in a recent article Mr. W. S. Hadaway, who speaks with some authority on this subject, after referring to the rates charged in New York, uses these words: "Taking the Edison company's rates and using the 50 per cent discount, as the rate to a large user, 40 cents will purchase eight horse-power hours or 20,518 thermal units." This, it will be seen, would make the price to large consumers (those using 1,500 horse-power hours per month) only five cents per horse-power hour, or, say, 6.7 cents per kilowatt hour. The writer knows a city with a population of not over 100,000 inhabitants where electric power (500 volts) is to-day sold at 10 cents per horse-power hour, or, say, 13½ cents per kilowatt hour. When a larger demand arises for current for heating and lighting purposes, the price can undoubtedly be reduced in all the large cities to a lower point than at present, and in those of the first rank seven or eight cents will probably be a price readily paid.

With regard to the heating of buildings, it may be freely admitted that the economic advantages are at present not so apparent. In most large buildings, such as factories, workshops, office buildings and the like, exhaust steam is usually available, which it is economy to utilize, and in ordinary dwellings the many forms of heating stove are hardly likely to be displaced until either the rates for current are very much lower than can be expected for some time or the conversion efficiency of the electric radiator is even still further improved. Probably both these conditions will need to be realized.

At the same time electric heating presents many advantages where cost is not the controlling element, and in many cases even that feature is not so disproportionate as might be imagined. Indeed, in some instances, electric heating might be the cheapest to employ. For example, in the case of a large factory possessing an electric plant of its own and having detached buildings which required to be heated, the extra cost of operating its electric plant, or a portion of it, and the interest on the cost of the appliances required, might quite conceivably be much less than that of heating by other means. Considerations of convenience might also in other cases outweigh any moderate increase in cost.

(To be concluded.)

Collapse of a Bridge on an Ohio Electric Railway.

An iron bridge at Bedford, Ohio, on the line of the Akron, Bedford & Cleveland railroad, collapsed on January 9. The accompanying illustration shows the appearance of the bridge after the accident. This is a recently-opened electric railroad, 30 miles long, running from Cleveland to Akron, Ohio. It is standard gauge, with 60-pound T and girder rails, and has an equipment of 10 motor cars and two trailers. The bridge fell under a train composed of a motor car and one carload of coal. The conductor and brakeman were killed in the accident.

This occurrence illustrates the importance to electric railways of first-class engineering and shop work in the construction of such bridges as they may be compelled by force of circumstances to build. A correspondent of the *Railroad Gazette* refers to the matter as follows:

The Bedford bridge was a single span of 140 feet, with a trestle approach at either end. The form of truss was a deck Pratt of five panels, 26 feet deep, with a secondary system bisecting the panels. It was for a single track only. The grade of the track was about six per cent, ascending toward the south, and the track was supported above the top cord by a low trestle from eight to twelve feet high, uniform with the trestles of the approach, which, however, were 26 feet high, or less, supported on stone block pedestals.

The entire structure was designed as for an ordinary highway bridge, with a rolling load of 1,440 pounds per lineal foot of track and a factor of five. The track stringers were 15-inch I-beams, supported directly upon the trestle posts without floor beams, in spans of 14 feet. All the lateral bracing was extremely light and composed of tension numbers only generally single angles, two inches by two inches by one-quarter inch. The track was about 40 feet above the bed of the stream at mid-span.

The power house stands at the north end of the structure, and trains coming down the grade would be under control of the brakes on the bridge in order to stop at that point. It was customary to use sand on the track upon the bridge. In the above estimate of the moving load, however, no allowance is made for impact or longitudinal thrust of the train.

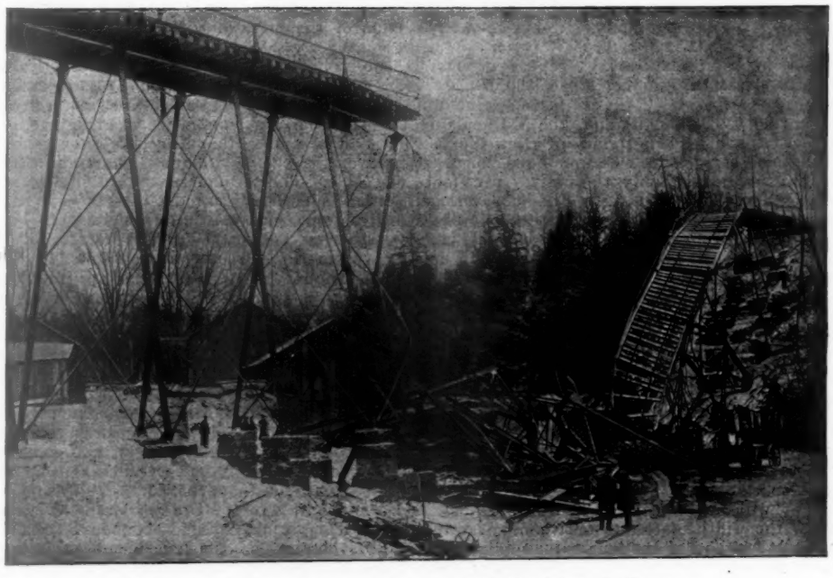
The end braces and top cord consisted of a plate and two channels, latticed on the under side. The other thrust numbers were composed of four angles, latticed, and the tension members, of two angles each, not connected. The lower cord was of two seven-inch channels, latticed top and bottom. All connections were riveted with three-quarter-inch rivets.

The material was of steel throughout, which proves, on analysis, to be very high in phosphorus. The fractures indicate a very brittle material, although under steady pressure specimens might be bent double without rupture.

The ordinary traffic of the road is by single cars on two trucks and weighing about 16,000 pounds, or, with a crowd of passengers, 30,000 to 32,000 pounds on a base of 28 feet. At the time of the wreck the actual load was a car of coal weighing 89,000 pounds and a motor of 16,000 pounds, coming down the grade with brakes being set.

If the disaster were not sufficiently accounted for by the poor quality of the material, the lightness of the design and the insufficiency of lateral bracing in a high and narrow deck bridge, it would be made clear by the fact that through some inadvertence one pair of tension bars in the second panel, designed for the main diagonal, was made to change places with the secondary diagonal in the same panel. This required a theoretical stress of 50,990 pounds to be carried by two angles three inches by two inches by one-quarter inch, having a net section of two and one-eighth square inches. This error occurred at all four points of the bridge. At one point one bar of the pair showed an old break, so that the other single bar must have been doing all the work in the truss at that point for some time. The loaded car was precisely over this quarter of the span when the rupture occurred, the actual stress in the bar at that moment being 56,000 pounds per square inch of net section.

Even under the ordinary traffic this bar must have been repeatedly subjected to a stress of over 20,000 pounds per square inch, and it is a wonder that it did not fail sooner than it did. The bridge was only erected in October, 1895.



The Wrecked Bridge of the Akron, Bedford & Cleveland Railroad.

American Institute of Electrical Engineers.

The 103d meeting of the Institute will be held at 12 West Thirty-first street on Wednesday, February 26, 1896, at 8 o'clock P. M. As already announced by a notice framed by the Committee on Incorporation to comply with the laws of the State, the first business of the meeting will be the consideration of a proposition to incorporate the Institute. The discussion of the paper by Mr. Frank J. Sprague on "Electric Elevators: Their Uses and Advantages," will be taken up in accordance with the action at the last meeting. The postponed discussion will be reopened by Dr. Cary T. Hutchinson. The usual meeting of the western members will be omitted.

Fluorescing Salts for X-Ray Experiments.

The universal interest displayed by physicists in Roentgen's recent discovery has developed an unprecedented demand for the salts of platinum, which fluoresce under the impact of the X rays. Messrs. Baker & Company, the platinum refiners of Newark, N. J., inform us that they have sold more of the particular salt recommended by Roentgen as most suitable for X-ray experiments, namely, barium platino cyanide, than ever before in the history of their business, and that in consequence of the undiminished demand for the salt they have been obliged to increase their laboratory force.

New York Electrical Society.

On the invitation of the Edison Electric Illuminating Company of New York, the next meeting of the New York Electrical Society will be held at their station, 57 Duane street, on Thursday, February 27, at 8 P. M. On this occasion Mr. John W. Lieb, Jr., the president of the society, will deliver an address on "The Generation and Distribution of Current by an Edison Station." By the courtesy of the company the station will be thrown open for the inspection of the visitors.

The Partz Acid Gravity Battery.

The Partz acid gravity battery and accessories, made by the S. S. White Dental Manufacturing Company, of Philadelphia, have been the recipients of many flattering testimonials. One of the strongest of these is related by the manufacturers, as follows:

In the general offices of the Pennsylvania Railroad Company, South Fourth street, below Walnut, Philadelphia, the Partz acid gravity battery with porous cup is and has been used for ringing the bells of the entire building since 1888. There are about 500 of the bells, which are manipulated by about 1,000 push-buttons. In so busy a place as the headquarters of the Pennsylvania Railroad, it may be well imagined that the office of the battery which rings the bell is no sinecure. Yet six Partz cells of the No. 2 type do the work, and do it well and economically; otherwise they would not have held their place for five years, but would have been "removed" for incompetency. These six Partz cells replaced 16 bluestone cells. But this is not all. The wiring of the building was done some years ago, when the principles and methods were not so well understood and materials not so good as they are to-day. The wires pass through brick walls and arches, and over iron columns, in numerous places, creating in the aggregate considerable leakage. But the Partz battery never falters, but goes right on, and the bells respond to the touch of the buttons just as if there was no leak. These cells have the liquid replaced and are given a thorough cleaning about once a year on an average. When the current shows any sign of weakening, a small quantity of Partz sulphochromic salt is dropped in each cell—on an average about three or four times each year. Further than this they have received no attention. The old zincs were replaced twice during the five years the cells have been in continuous service.

The statement of facts in the foregoing can be readily verified by application to Mr. D. S. Newhall, assistant secretary, or Mr. W. T. Brown, electrician of the general offices of the Pennsylvania Railroad Company, Fourth street, below Walnut, Philadelphia.

A New Electrical Society in Brooklyn, N. Y.

A society of electricians is being organized in Brooklyn, N. Y., the objects of which will be to draw together practical men, to establish a place of meeting and to provide literature and apparatus for their use.

It is proposed to divide the membership into two classes—*i. e.*, associate and active—associate members being those who are or have been identified with the electrical or allied industries, or who are qualifying themselves to become familiar with the same; active members being those who possess a thorough knowledge of the sciences. It is the intention to adhere strictly to these rules.

A meeting will be held at 17 Whipple street, Brooklyn, on Friday evening, February 28, to elect temporary officers and to adopt a constitution.

The membership at present includes men well known in the electrical field, both by their practical and technical works, all the central power and light stations being well represented.

BOSTON'S GREAT STREET RAILWAY SYSTEM.

LARGEST AND BEST EQUIPPED SERVICE IN THE WORLD—THE "WEST END" AND WHAT IT HAS DONE FOR BOSTON AND HER SUBURBS—A BRIEF OUTLINE OF THE SYSTEM AND ITS OPERATION.

The Massachusetts Railroad Commissioners, in the advance sheets of their annual report, just submitted to the legislature, devote considerable attention to a discussion of the merits of electricity as applied to methods of transportation. There is no doubt that this important agent has been forced on their attention rather than sought for by them, and their ideas in regard to it, so far as can be obtained from the meager sources of information at hand, seem to be rather of a negative order.

There is one paragraph, however, which seems particularly open to criticism, which is that "the board even considers that the case of horse *vs.* trolley on street railways is unsettled as to economy." This seems a peculiar statement to make, with the West End road operating before their eyes. The question of economy as between horse and electric traction seems to have been entirely eliminated by the demands of traffic, which have grown to such an extent as to relegate horse-power into the realms of antiquity. No doubt a few cars can be operated and a limited number of passengers carried cheaper by horse-power than by electricity. The same could be said of the old time stage coach as compared with the modern railroad; but both are equally inadequate to the demands of the present day.

Any one who will spend a few days in going over the lines of the West End road, noting the conditions under which they are operated and the number of passengers carried, can not fail to realize this fact nor to marvel at the vast proportions of the transportation facilities which the past few years have developed.

Boston, of all cities in the United States, offers peculiar advantages for this development, owing to its extremely condensed business section and its large suburban population. Of the 1,000,000 inhabitants of Metropolitan Boston, 75 per cent are residents of the 26 beautiful cities and towns composing these suburbs, all of which are tributaries of Boston, from the business interests of which they derive support. Of the beauty of these suburban residential sections of Boston too much can not be said, and, considering the transportation facilities now furnished by the network of electric roads which penetrate them on all sides, comparatively too little is known outside of the inhabitants themselves. There are probably very few people, even among Bostonians, who realize the perfection to which these connecting inter-urban lines have been brought, and the vast amount of territory which can be covered in a day's trip in almost any direction.

Take the inland farming country north of Boston, for instance. A trip through this region, embracing nine cities and towns within 20 miles of Boston, and covering 40 miles of inland and coast roads, can be made in a day's run on the electrics at a cost of 80 cents.

Another trip of 29 miles through the beautiful regions of Brookline, the Newtons, Waltham, Watertown and Cambridge can be made for less than 50 cents and furnishes some of the choicest bits of scenery and points of historical interest to be found anywhere.

Another delightful run is that to Nantasket, through Quincy, Weymouth and the coast towns south of Boston, and can be made for 60 cents for the round trip of 35½ miles.

These are merely samples of the opportunities offered by the West End and connecting systems for an intimate acquaintance with delightful regions which the advent of electricity has put within the reach of all.

The only disadvantage offered by Boston to electric traction, and it is a serious one, where it is encountered, is the narrowness and crookedness of the streets in the business section of the city, where the growth and traffic of commerce has entirely outstripped the capacity of the cow paths originally laid out.

Washington and Tremont streets are the two principal arteries running through this section, and for a distance of perhaps half a mile are the thoroughfares for cars which converge from every section of the city. The overcrowded conditions of these streets and the amount of time lost in picking a way through this short distance may be imagined when it is stated that on this section of Tremont street alone 4,371 cars pass and repass each other during a single day, while on Washington street the number is nearly or quite as large.

It is to obviate this difficulty and to relieve the streets of all this traffic that the subway is being built. Cars will enter it at three points only, the first being on Tremont street near the junction of Shawmut avenue, the second in the Public Gardens from Boylston street and the third at the Union Depot at the lower end of the city. From the entrance on Boylston street the subway runs under the edge of the Public Gardens and the Common as far as Park street, and for the greater part of this distance there will be four tracks.

After leaving the Common at Park street it branches out under Tremont street, and for the rest of the distance to the Union Station there will be two tracks only.

The height will be 14 feet from rail to roof, the width of the two-track section 24 feet and of the four-track section 48 feet.

The station platforms, of which there will be six, are to be about 16 feet below the surface of the street. The length of the subway is about one and one-third mile, and it will contain nearly five miles of single track.

It is hoped the subway will be completed within the next three years, but the probabilities are that the new century will have opened before the subway does.

As to the West End road itself, the name is synonymous with all that represents the progressive element in street railway work. Virtually the pioneer in electric railroading on a large scale, the company have done more to bring the industry to its present state of efficiency and economical operation than would appear at first sight, the result of their many and costly experiments having wielded a powerful influence in the construction and operation of newer roads, whose officers have profited freely by the advanced methods in both these lines which experience had shown to be of value.

The West End Street Railway Company was organized in 1887 by a few wealthy gentlemen interested in large tracts of undeveloped land along the Charles River, which was then known as the "West End," and it was for the development of this district that the railway company was organized. The capital stock at first was only $80,000, yet within a year they had brought about the consolidation of all the principal lines in the city and were operating the largest street railway system in the world, over 231 miles of track. Their history from that time forward is well known.

The improvement in the service from year to year, the adoption of electricity as motive power, and the vast changes in every item of construction and equipment thus made necessary, the extension of their lines into new territory, and the development of suburban real estate which rapidly followed, all are matters of history.

The costly experiments looking to better results in both track construction and rolling stock, and the thousand and one steps in advance toward economy of operation, are not so well known, but their results have stood as a standard for other roads, and done much for the improvement of the whole system of electric traction.

The West End, as well as all other electrical interests in Boston, is now busily employed in putting a portion of its feed wires under ground, in accordance with an act of the legislature, which stipulated that this should be done throughout the central or business portion of the city. This work is being pushed ahead as rapidly as possible, the cables being of 500,000 circular mils capacity, placed in conduits manufactured by the National Conduit Mfg. Company, of New York. The cost of underground construction averages about $1.20 per foot of cable. Their present overhead system is entirely of span wire construction, iron pipe poles being used almost exclusively. These are ordinarily set 125 feet apart in a concrete foundation and are extra heavy in construction.

The lightest pole is six, five and four inches in diameter, for use on streets of ordinary width. The medium pole is of seven, six and five-inch pipe, for extra wide streets, and for curve construction a pole eight, seven and six inches in diameter is used.

The trolley wire is of No. 0 hard-drawn copper, and the guard wire No. 5 galvanized iron. The various line appliances are the best obtainable, the bulk of them being furnished by Albert and J. M. Anderson, of Boston.

The rolling stock of the West End company consists of something over 1,800 cars, about equally divided between open and closed, besides about 600 horse cars. They are painted in nine different colors, corresponding to the nine main divisions of the system, and are scrupulously kept up to a high standard of cleanliness and efficiency. All cars now being ordered from different makers are built on plans and specifications furnished by the company, making them exactly alike in all mechanical details, and greatly reducing the number of supply parts necessary to be kept on hand.

Standard trucks of the company's own design are largely used, the principal features of which are simplicity and few parts. About 75 per cent of the cars are equipped with G. E. motors of various types and the balance with Westinghouse "No. 12."

The "Type K" controller, made by the General Electric Company, has been adopted as a standard.

The box cars are being very generally equipped this Winter with electric heaters, most of them furnished by the Consolidated Car Heating Company, of Albany; but while the fact that they are there may be sufficient to keep some people warm, their presence is evidenced more by sight than any perceptible effect on the atmosphere.

As a factor in removing snow from the streets of Boston, the West End road is very much in evidence; indeed, their efforts in this direction are pre-eminent, and the city authorities are content to leave them in undisturbed possession of the field.

Indeed, it is safe to say that from the first to the last snowfall of the Winter, the city does not remove as much snow from the streets of Boston as the West End company dispose of in a single day.

Outside of these tracks the feathery element remains untouched, and everything travels on runners as long as they will slide, or until some warm rain or a glimpse of Spring sunshine removes it through the medium of the sewers. It is no uncommon thing to wade through six inches of slush on any down-town crossing in the business district outside of Washington and Tremont streets, day after day for weeks at a time; so rubber boots have naturally become a fixture in the Winter apparel of both sexes.

The West End company have a force of 115 electric snowplows, besides a large number of horse plows, and, by keeping these in operation all the time during a storm, their lines are seldom or never blocked. The snow removed from the tracks is carted away in sledges, and during a heavy storm the company employ a large amount of extra labor, which is handled systematically and to good advantage. The cost of handling the snow each Winter will run from $60,000 to $100,000, quite an item toward swelling the expense account.

The car houses, of which there are 23, for the housing of the electric cars, are each in charge of a separate foreman, and all the horses in each of the nine divisions are in charge of a division superintendent.

A system of classing of apparatus is used by putting all cars equipped with the same apparatus, so far as possible, into the same car house, which greatly simplifies the making of light repairs, which is done at these houses, and reduces the stock necessary to be kept on hand for this purpose.

The heavy repairs are handled at a special shop on Bartlett street, and the trucks and other apparatus are taken care of at the main machine shop on Albany street.

Of the power stations of the West End road much has already been said, and the apparatus has been so often described that merely a passing reference to it is necessary. The company have now four, or rather five, stations in operation, the central station having an important auxiliary, and a new station, modern in every respect, is now under construction in Charlestown.

Each of these stations embodied, when built, the most advanced methods of the day, but there have been many new developments since they have been in operation, which the company have not been slow in adopting, and some very important changes in power generation are now under way.

The most important of these is at the Central Station on Albany street, where the original equipment consisted of six triple-expansion Corliss engines, in a double row, and belted to two countershafts located between the engines on the basement floor. The flywheels of these engines are 28 feet in diameter, with a 10-foot 6-inch face, and carry two five-foot belts. They are run at 73 revolutions, and their rated capacity is 1,000 horse-power, but they are run up to 2,000 horse-power right along.

The generators are located on a

raised gallery above the countershafts to which they are belted. The alterations now going on consist in changing the power from belt-driven to direct-connected, and two of the triple expansion engines have already been altered over. This is done by removing the immense driving wheels and substituting therefor a 1,300-kilowatt generator of the latest type, direct c nnected to a new shaft, which, with an entirely new style of balance wheel, occupies the same space formerly filled by the driving wheel alone. The engines are driven at a little higher speed, about 78 revolutions, and develop 1,500 horsepower each. In addition to these a new cross-compound E. P. Allis engine has just been put in, direct connected to a 12-pole 1,500-kilowatt generator, which develops 2,000 horsepower at 75 revolutions, and is good for a 50 per cent overload.

It is the intention of the company to alter over the remaining four triple-expansion engines into direct-connected, and to add one or possibly two new ones like the last, as early as practicable, the changes in the others and the doing away with the countershafts and separate generators leaving sufficient space in the center of the building. When this is accomplished they can discard the old auxiliary station, which was the first one built, and from its old style equipment is an expensive one to operate. It contains 10 McIntosh and Seymour engines of 500 horse-power each and 40 old D 62 generators. Taken in connection with the main station, it furnishes a striking illustration of the difference between old and new-style methods, but in spite of this is doing good work and contributing 5,000 horse-power right along. It is used only at night or when a storm calls for additional power in the daytime, and suffices for all purposes until the completion of the changes in the main station, when the 20,000 horsepower developed there will make its further use unnecessary.

The flywheels used in connection with the direct-connected generators are something entirely new and worthy of special mention. They are 24 feet in diameter, with a face of only 19 inches, as against 10 feet six inches in the old driving wheels. They are built up of steel plate, and are practically indestructible. The hub is of cast-iron, eight feet in diameter. Surrounding this hub are two plates of steel one inch thick and 23 inches wide. From these extend 16 web plates also one inch thick to the outside diameter of the wheel, and faced along the edges so as to form a good joint. Between these on opposite sides of the hub are one-inch and eight-inch truss pieces, bolted at the ends and centers. These truss pieces are put at the joints between web plates. The outside of the frame is faced over with steel plates, leaving the center hollow up to within nine and one-half inches of the outer circumference, where it is built up solid of one-inch plates riveted together and to the web frames, making a solid outer rim nine and one-half inches in depth.

The total weight of this wheel is 150,000 pounds, and at 75 revolutions the speed at the circumference is 90 feet per second, or a little over a mile a minute.

Since the new engine was installed, four 500 horse-power double-decked boilers have been added to the boiler plant.

The other stations are located in East Cambridge, Allston and East Boston. The first of these is similar to the central station in general equipment, although, of course, much smaller, having only three engines. The Allston station is equipped with high-speed engines, belted direct to bipolar generators of the Edison No. 32 type of 80 kilowatts each, and were, at the time they were installed, the largest generators built for street railway service.

The East Boston station is a handsome brick structure, and contains three tandem compound engines, direct-connected to 200-kilowatt generators of the General Electric multipolar type.

The engines run at 120 revolutions with 125 pounds of steam pressure, and are rated at 250 horse-power, but are so arranged that by extending the point of cut-off to three-quarters of the stroke they will develop 400 horse-power each.

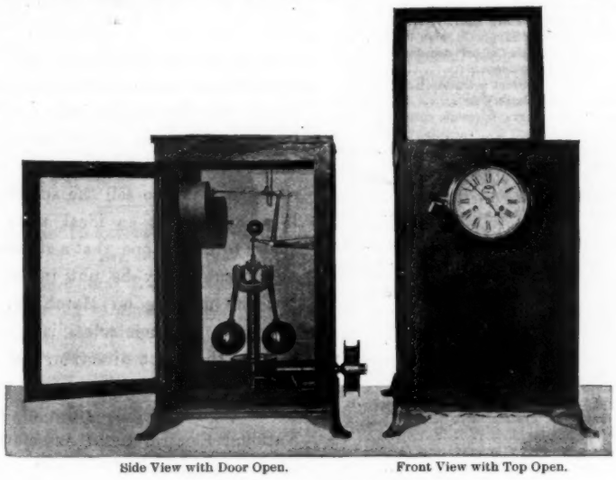
The new power station in Charlestown is now almost completed, and is in every respect a modern plant. It contains two direct-connected engines and generators similar to the last one put into the central station, and three 500 horse-power double-decked boilers.

It is needless to say that the electrical equipments and methods of handling the current at all the stations are of the most modern type, the West End management believing thoroughly in having the best of everything regardless of cost. It is owing to this principle, well carried out, that they occupy the position they do to-day, of having the best equipped and best operated street railway system in the world.

The magnitude of the business they handle and the infinite number of details to be looked after in its conduct may be gathered from the fact that the company carry about 4,000 men on their regular payroll, and at times several hundred more. Their lines extend over 250 miles of track, and it is estimated that the electric roads handle over 130,000,000 passengers yearly, as against 50,000,000 carried by all the steam roads entering Boston.

The general management of the company is in the hands of Mr. C. S. Sergeant, who has been connected with it since its consolidation, and to his executive ability and genius in perfecting the organization of the immense system much of its success is due.

The officers of the West End Street Railway Company are as follows: President, Samuel Little; vice-president, Prentiss Cummings; general manager, C. S. Sergeant; treasurer, J. H. Goodspeed; auditor, H. L. Wilson; general superintendent, J. E. Rugg; master mechanic, C. F. Baker. Executive Committee: Walter Hunnewell, Henry D. Hyde, F. L. Higginson, Theophilus Parsons. Directors: Samuel Little, Alfred Bowdich, G. T. W. Brennan, F. L. Higginson, Wm. Hooper, Albert C. Houghton, Walter Hunnewell, Henry D. Hyde, E. D. Jordan, Theophilus Parsons, Samuel Spencer, Walter S. Swan, R. Rodman Wild, Henry M. Whitney, Alfred Windsor. Clerk of Corporation: Prentiss Cummings. H. G. T.



Side View with Door Open. Front View with Top Open.

FIG. 1.—THE LOMBARD SPEED RECORDER.

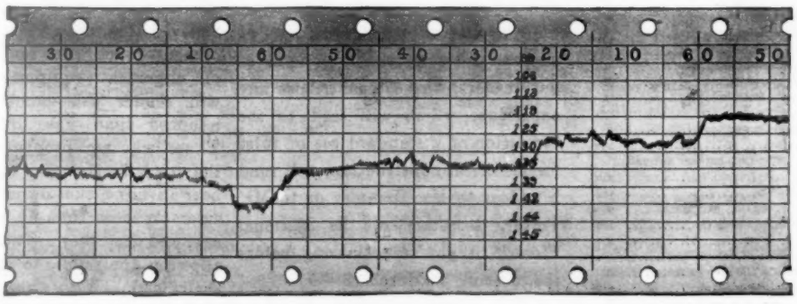


FIG. 2.—RECORD OF SPEED MADE BY THE LOMBARD SPEED RECORDER.

A New Speed Recorder.

The exact time when machinery starts, when it stops, and the rate of speed at which it runs each minute while it is in motion, should form part of the daily record kept in every electric light or power station. Such a record answers hosts of otherwise unanswerable questions which will suggest themselves to every engineer and station superintendent, and there are few managers who would not give much occasionally to have accurate information of the above sort.

The Lombard Water-Wheel Governor Company, 61 Hampshire street, Boston, Mass., has recently put on the market an instrument which makes such a record. A photographic reproduction of this machine is shown herewith; also an illustration of the paper strip showing a record of speed. It will be seen that the speed, corresponding to each longitudinal line, is printed on the paper strip so that there can be no mistake in reading the speed correctly; these figures are printed at six-inch intervals.

At the upper edge of the paper strip, numbers from 10 to 60 are printed. These indicate minutes, and at the beginning of each hour the pencil making the record of speed stands directly over the vertical line marked 60. The paper is fed forward by clockwork, from left to right, the distance between each vertical line, every five minutes; and by writing the corresponding hour on any line marked 60, the time corresponding to any other line may be easily found.

There are many good points about this machine, some of which deserve special mention. The paper strip (which comes in continuous rolls of 1,000 hours) feeds fast enough so that the time of any speed variation may be easily located to one minute; also rapid fluctuations of speed—such, for example, as those due to the racing of an engine—make a perfectly clear and easily understood record.

The instrument is as sensitive as is desirable for station purposes, easily recording variations of one-half of one per cent in speed, and the record may be relied upon as correct, for not only are moving parts perfectly proportioned, but each instrument is set up and run and carefully adjusted before shipment.

This speed recorder is strongly built, highly finished and is inclosed in a quartered oak and glass case which locks so that the record may not be tampered with by unauthorized employés.

An article by Cleveland Moffett in *McClure's Magazine* for Maroh will describe the curious and important scientific uses lately made of kites, especially in the departments of meteorology, electricity and photography. It will also describe how to make the modern tailless kite, how to fly kites in tandem and the possibilities of the kite as a coming instrument of war. Along with other pictures, there will be a number of views photographed from a kite at an elevation, in some instances, of 1,500 feet.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, FEB. 26, 1896.

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Following the successful placing of the government bond issue, a better feeling is prevalent in business circles, which is also in evidence in the electrical trade. The large amount of electric railway work contemplated for this Spring would seem to insure an unusually prosperous season for that branch of the field.

STANDARD RULES.

Mr. W. J. Hammer's communication on another page should merit the attention of every one interested in electrical work. The need of an absolutely standard set of rules for the installation of electrical work is demonstrated forcibly every day. Not only the electrical contractor and engineer is interested in the matter, but the manufacturer of electrical specialties is concerned. His local insurance board may pass as acceptable a certain wiring appliance which may be condemned by the inspector in some other territory, thus cutting down his available territory in which to sell the specialty. It seems almost an ideal state of affairs to even hope that a standard set of rules may be put in force. But the meeting on March 18, to which Mr. Hammer refers, is a long step in the right direction, and we hope that some practical result may be arrived at. The rules of the National Electric Light Association have been the basis for nearly every other set of rules formulated. Now, if the good points of all could be combined in one brief standard set of rules which could be rigidly enforced, the ideal condition would be attained. The National Electric Light Association is to be congratulated on inaugurating this movement, and especially for the broad attitude it assumes in the matter. Every one is invited to send suggestions, preferably derived from practical experience, as to what the new code of rules should include. On behalf of an important step which will, both directly and indirectly, be of great benefit to every man in the electrical industry, we express the hope that every one of our readers, who can contribute any experience which will lead to the formation of a standard set of rules for electrical construction, will send his ideas to Mr. Hammer or to Mr. Porter, secretary of the National Electric Light Association, before the meeting on March 18.

We have had an inquiry from a correspondent asking us for information of any central station in the United States which runs large alternating dynamos in multiple. We would be pleased to hear from any of our readers on the subject.

The article in this issue of the ELECTRICAL REVIEW on the extensive electric railway system of Boston is a concise and readable summary of facts about that city's great rapid transit facilities.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The financial sky is much clearer than it was at my last writing. The success of the bond issue that has already resulted in placing the gold reserve at $115,000,000 or thereabouts, with more to come, is fast re-establishing confidence in the business world. It is doing more, in that it is directing the attention of foreign capital towards the security bargains that may be obtained in this country. The exclusiveness of British money, that has been so pronounced of late, has resulted in running up consols to 110. This is the highest price ever recorded and returns a yield on the investment of considerably less than 3 per cent. Other gilt-edged securities of that country are proportionately high. It is but natural that the millions of idle English funds should be looking elsewhere for employment. This was the meaning of quite a heavy demand, which old-time favorites, like Louisville & Nashville, St. Paul, Atchison & Union Pacific, experienced during the week. Prices responded so easily that the limit of English buying orders was reached, temporarily cutting off the demand. One of the strong features of the week was the advance in Governments to 118, or some 5 points from the low of January. Railroad bonds also had a better inquiry. Trade in most lines is sluggish, although it is holding its own. Wall street has about given up all hope of any relief from Congress and will be well satisfied if no measure inimical to values is seriously considered.

The electrical field was moderately active during the week. Quotations, as a rule, closed at about their best figures. General Electric's opening was 30¾. The high was 32 on Thursday and the close a slight fraction lower. While there are two opinions regarding the value of this stock, it seems to be generally conceded that it is slated for an advance of a manipulative character, and it is believed that recent favorable developments in litigation and the booking of important equipment contracts will render this much more pronounced than was first intended. Those who are prophesying 10 for the stock in the near future should bear in mind that owners paid considerably more than 50, on the average, and that they are not adverse to allowing the public to carry part of their load. With this in view an advance well into the 40's would not be surprising. It would be possible in a general bull market.

The latest concerning the company's extensions is the report that the Washington street railway system, which has been experimenting with the underground trolley, installed by General Electric, has ordered equipment for 80 additional cars.

The bonds of the company are well thought of, and sell almost daily in small lots around 90.

Edison Electric Illuminating of New York sold at 95. The net earnings for the month of January show

an increase of $12,536. The old bonds sold at 108½ and the consolidated bonds at par. A small block of Brooklyn Edison Electric Illuminating 1sts sold at 109.

The New York & New Jersey Telephone Company have called a meeting, to be held in Brooklyn on March 12, for the approval of a proposition to increase the capital stock from $3,500,000 to $5,000,000.

The activity in the stock of the North American of late brings out the fact that the company has been offered a very satisfactory price for a portion of its remaining assets. A sale would enable it to pay off its debts and leave something. The completion of the reorganization of the Milwaukee Street Railway Company, in which the North American company is greatly interested, is regarded as very favorable to the stock. Generally speaking, investors should be very careful about taking hold of a wreck. This is little more of a shell, and there is plenty of stock which insiders would be willing to part with advantageously.

The General Electric preferred stockholders' committee has received the support of one-half the preferred stock, and is making a canvass of further assents. It is proposed to prevent, if possible, any scaling of the securities or accrued interest in a correction of the capital impairment, such as the company proposes to make during 1896. The common shareholders, as a rule, believe that the preferred should stand its share of any reduction, and, while willing to sacrifice about one-half of their stock, they will not consent to giving up a larger fraction.

One of the most suggestive developments in the New York traction field in the week was the statement of earnings of the Manhattan Elevated system for the quarter ending December 31. It showed earnings on the stock of 1.03 per cent as against dividend requirements for that period of 1.5 per cent. The earnings during the corresponding period of 1894 were 1.59 per cent, and in 1893, 2.38 per cent. The Metropolitan Traction system did not become aggressive much before this last-named date. The result is a decrease in its net earnings for Manhattan in the last quarter of the year as compared with the last quarter of 1893 of $245,283. The decrease in gross was $229,621. On a basis of 20 passengers to $1, this is a loss in one quarter, usually the best of the year, of about 4,500,000 passengers. The most surprising thing in this connection is that, while gross earnings have decreased, operating expenses have increased, the amount in excess being $5,662, or, in other words, that it cost that amount of money more to care for the traffic that was approximately 4,500,000 passengers less. The explanation lies in the express service which the company has inaugurated with a view of holding its business. It is very apparent that unless it does something soon to improve its service, it will, from a 6 per cent dividend standpoint, be numbered among the "has beens." Competent authorities say that the one thing that will enable the company to maintain its prestige is electric motors, heat and light.

BAIN.

New York, February 21, 1896.

The Westinghouse Electric Locomotive.

The first electric locomotive built by the Westinghouse-Baldwin combination, illustrated exclusively in the ELECTRICAL REVIEW last week, is being fitted with its electrical apparatus at the East Pittsburgh shops of the Westinghouse Electric and Manufacturing Company. This work will probably be finished next week, and the locomotive will then be tested on the Turtle Creek branch of the Pennsylvania Railroad. Steam railway men are said to be watching the development of this type of locomotive with unusual interest, owing to the reported low cost of the machine and the claims put forward for its speed and efficiency. The cost of the Westinghouse-Baldwin locomotive is reported at about $11,000.

Cutter Electrical and Manufacturing Company.

The Cutter Electrical and Manufacturing Company, 1112 Sansom street, Philadelphia, has issued the following notice:

The Cutter Electrical and Manufacturing Company takes pleasure in announcing that the assignment made in August last has been dissolved, and, with largely increased capital, it will continue its business, as heretofore. The company will devote special attention to the manufacture of its C. S. flush switches and the I. T. E. automatic magnetic circuit breakers. The demand for "circuit breakers" is already taxing the present capacity of its factory. The same careful attention to detail will insure a high standard of excellence in the several articles produced.

Texas Street Railway Association.

The Texas Street Railway Association will hold its second annual convention at Galveston, on March 18 next. The officers are W. H. Sinclair, president, Galveston, Texas, and C. L. Wakefield, secretary, Dallas, Texas. These, with W. H. Weiss, of San Antonio, Geo. B. Hendricks, of Fort Worth, and C. A. McKinney, of Houston, represent the directory. Supply men will be welcome, and space will be provided for them for exhibits, if they desire it; applications for same to be made to J. K. Urie, care Galveston City Railroad Company, Galveston, Texas.

Electric Light in the London Post Office.

A London newspaper quotes Mr. W. H. Preece as saying that since the electric light was introduced into the general post office the number of days of absence among the employés and officials had been reduced at the rate of two per annum for each one. By calculating the amount of saving represented by these additional days, he finds it to be sufficient to pay for the electric light.

President Wilmerding, of the National Electric Light Association, spent last week in New York arranging certain details of the programme for the next meeting of the association in this city.

The New Photography.

[*From The Lancet, London.*]

All sorts of crude ideas seem to be current as to the application in medicine of the new radiations or "X" rays. We had an inquiry from a lay correspondent last week as to where the apparatus producing these new radiations could be obtained, "as it was wanted for a case of consumption." But a very general impression appears to be that the rays have been obtained in such abundance as to be able to permeate through any thickness. This is not so, and the source of the rays must be infinitely more powerful than is obtainable by present means, if they are to be capable of assisting in the exploration of remote cavities in the human organism. Excellent photographs have been produced of bodies, such as the hand, which are not sufficiently thick to offer a complete resistance to the passage of the rays. It is just the same with a thin sheet of glass, which is transparent enough to ordinary light, but on increasing the thickness of the sheet a block may at length be obtained which is almost completely impervious to light. Still there is no gainsaying the fact that much good work may be done with the means at present available towards utilizing the discovery for surgical purposes. Thus foreign bodies, bullets, etc., have been located with distinctness in the hand, and the extent and position of necroses have been usefully ascertained. We learn, also, that photographs have been produced of tuberculous affections of finger joints and also of one case of a thigh bone attacked with osteomyelitis. In the latter case the method has proved valuable in indicating that the disease known under this name is wrongly considered as a variety of periostitis, since, if this were so, the bony alterations would have transferred themselves from the surface to the center, whereas the photograph shows that the surface of the bone is intact whilst the internal layers are destroyed as far as half a millimetre from the surface. During the week it has been announced that the flame of a Bunsen burner and of an ordinary paraffine lamp evolved the same radiation, but in a less degree, yet enough, it is said, to produce more or less distinct photographs of the unseen. But the most remarkable development of Roentgen's discovery is that announced from Rome, in which it is stated that Professor Salvioni, of Perugia, has just discovered a means by which these radiations may be made to so far assist the eye as to enable it to see through all objects which the rays can penetrate, so that the contents of a closed space are revealed. This discovery, if true, will far outstrip the former one in connection with its importance as an aid in diagnosis. The nature of these rays is still a puzzle, but the theory which regards them as material radiations seems to be rapidly gaining acceptance. The fact that similar shadow effects may be produced without a Crooke's tube and by merely placing a negative behind the discharger of the induction coil would point to electrical effect. The most intelligible theory is, we venture to think, that suggested by Mr. J. W. Gifford. He likens the Crooke's tube to a vibrating tuning fork, which, if sounding simple A, would set an A violin string vibrating not only A, but its octave and the fifth to its octave and quite a host of other overtones or harmonics of rapidly decreasing wavelength which would seem to have no theoretical limit. The waves of long period from Crooke's tube would pass through wood, paper, the human body, without much resistance, but would be absorbed or reflected by the denser metals. But if objects capable of taking up their vibrations lay in the path of these long waves, they would set them vibrating like the violin string, and might in the same way produce overtones which did not before exist. These overtones may include waves of such short lengths as to cause the objects themselves to become luminous. If so, the light waves in question, although they are directly instrumental in darkening a photographic plate exposed to them, have nevertheless not passed through, and could never pass through, the obstacles easily traversed by the electric wave which gave them their origin. If this be so, the new photography is in reality electrography.

An Injunction Made Permanent.

An order was entered in the United States Circuit Court at Utica, N. Y., on February 20, in the case of the General Electric Company against the Elmira & Horseheads Railway Company, sustaining and making permanent and effective the injunction ordered by the United States Circuit Court and the United States Court of Appeals for the New York circuit, which in effect finally sustains a controlling patent of Charles J. Van Depoele for the overhead construction of electric railways.

Gasoline Engine Wanted.

TO THE EDITOR OF ELECTRICAL REVIEW:

Can you give me the name of some firm manufacturing a gasoline or kerosene engine adapted to the propulsion of bicycles, tandems, carriages, etc.?

Very respectfully yours,

B. C. W.

Amesbury, Mass., February 22.

An Electrical Whistle Wanted.

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you kindly advise us whether or not there is such a thing as an electrical whistle—one that is good and strong? If so, where and by whom is it manufactured?

Very truly yours, T.

Columbus, Ohio, February 19.

The Cable Business is Good.

Manufacturers of cable for all underground purposes are especially busy. Overhead wires of any kind in large cities are *passé*, and the cable man benefits thereby.

LIGHTNING ARRESTERS.

ABSTRACT OF A PAPER READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION, FEBRUARY 7, 1896, BY W. R. GARTON.

One of the most trying questions presented to the workers in the electrical industry has been the development of a reliable and accurate lightning arrester, which would effectually cope with and ward off the destructive blow commonly known as the static discharge. To this end many have

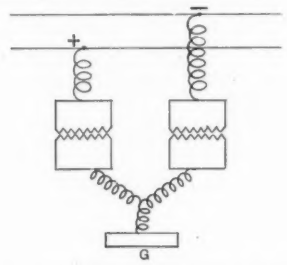


FIG. 1.—LIGHTNING ARRESTER WRONGLY WIRED.

striven, resulting not only in numerous developments but the outcome in many instances has been a most happy solution. The variety of design is almost as great as there have been ideas to promulgate and carry into effect. But no matter how efficient the device or how perfectly it performs its functions, it is useless unless installed in reasonable numbers, in well chosen places. It is very often considered a trick of the manufacturer in prescribing a goodly number of arresters, but both theory and practice have conclusively proved that, during the existence of the static influences, there are established nodal or non-discharging points where a discharge will hardly ever or never occur. These nodal points are constantly shifting, and therefore it is impossible to locate them, and the only possible way of avoiding them is to provide enough places of outlet, that some of them may be at the discharge point.

It is always advisable to place an arrester at the terminal of each line and especially if it is a long one, as it will almost wholly overcome an effect known as the "kick," which is very trying on insulation. When arresters are placed at the ends of lines, it is found that very heavy end or brush discharges take place. The most feasible explanation of the kick which I have been able to formulate is that similar to the jarring of a water pipe after the pressure has been released and suddenly thrown on again by the closing of the faucet. To overcome this concussion a small neck or extension of the pipe is made beyond the hydrant. Thus when the strain comes the water is forced to this little end or neck, which forms an air cushion and divides the force and neutralizes the shock; the same effect results upon a line and the end arrester has the effect of overcoming this sudden jar or kick.

The pride of the lineman ofttimes prompts him to inaugurate certain ideas which are most detrimental, such as, for instance, the addition of a few sightly turns or curls in the lead-in or lead-out wires; this alone in many instances is sufficient to completely counteract the good influences exerted by the arrester. I remember having seen this very idea so nicely carried out as to have rendered the lightning arresters of little or no value. (See Fig. 1.) In this particular instance the arresters were in a station connected to an arc circuit. I at once caught sight of these curls of wire leading to and from the arresters. Upon inquiry it was found that they were originally so placed. I also learned that the arresters had always proven very ineffective. I advised their removal and the straightening and shortening of the wires. I learned afterward that this had been done, resulting most satisfactorily. The execution of proper joints or proper contact in the joints is an essential which, quite often, is sadly neglected.

It has always been my custom when putting arresters on a line to insert as much hindrance in the pathway of the discharge, between the apparatus and the arrester, as possible. I almost invariably place the arrester tap in the extreme point of a very abrupt angle or kink in the feeder wire, thus aiding the arrester to turn the lightning to earth. (See Fig. 2.) I have found some of these

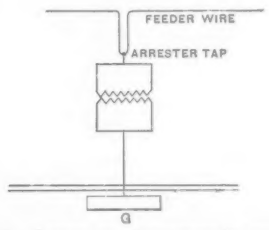


FIG. 2.—LIGHTNING ARRESTER CORRECTLY WIRED.

seemingly small things to give admirable results, even though in some instances the so-called arresters were not models.

It is well established that inductive resistance is the most formidable enemy of high frequency currents. Convolutions, turns or curls in a conductor, although few in number, offer more impedance to a discharge than do thousands of feet of straight wire. From this very fact it is obvious how burn-outs in apparatus occur. And it is plain how a small amount of inductive resistance is capable of debarring the static discharge where ohmic resistance can not withstand. Thus we arrive at the cause for the discharge puncturing the insulation in preference to traversing the path of the normal current.

In the case of the burning out of an armature or field, the windings offer a high inductive resistance. The lightning entering at one of the terminals must find a way of escape. (See Fig. 3.) Almost invariably this is through the insulation, or, if an armature, ofttimes from one commutator bar to the next, to an immediate point of outlet. The difference of potential betweeen the point at which the discharge punctures the insulation and the point of leaving the apparatus, due to the resistance of the circuit, which, in the case of an armature, would be counter-electromotive force and the field ohmic resistance, would tend to establish an arc maintained by the normal flow. The arc which has followed the lightning over the newly-established course is that which plays havoc. The overcoming of this by the use of a lightning arrester conclusively proves that such a device, if efficient, is invaluable for the preservation and perfect operation of apparatus thus exposed.

The fundamental principle of all lightning arresters is that of discharge points in conjunction with some high resistance between the two sides of the circuit and earth. This is in most instances an air gap. As far as the efficiency of the old original type of air gap, the same as that in use to-day on telephone and telegraph circuits, is concerned, as a lightning arrester, it is most capable. The reason why the simple air gap will not answer, on other than telegraph and telephone circuits, is, as has been described, namely, the formation of an arc. The lightning arrester to meet the requirements of railway and electric light circuits must therefore be possessed, not only with the capabilities of an arrester, but also those of a circuit breaker or arc defier.

Lightning arresters are divided into two general classes, viz., those for direct and those for alternating currents. Some manufacturers add still another type, that for high-tension, direct-current or circuit arrester. The first plan, however, is more predominant. Direct-current arresters vary very little from the alternating in general design, all being constructed upon the same general principles, with perhaps one or two exceptions—such as, for instance, the Wurts types, which vary quite materially in general make-up and form. Those of the Thomson, although of differnt types, are all constructed upon one fundamental principle, that of the magnetic blow-out.

The direct-current arrester is constructed for various voltages ranging from 50 to 5,000 volts, as well as for various current flows, but happily high-tension circuits are not circuits

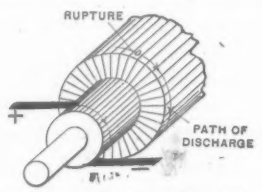


FIG. 3.—ESCAPE OF LIGHTNING THROUGH AN ARMATURE.

of high ampere ranges. The alternating arrester most generally has to do with circuits of small ampere capacity but high-tension, therefore requiring a different mechanism from that of the direct-current arrester. But the difference in tension and ampere capacity of the circuit does not always have to do with the different modes of dealing with the two different currents, but the nature of the current to be dealt with more generally controls.

Messrs. James J. Wood and C. S Knight, of the Fort Wayne Electric Corporation, Fort Wayne, Ind., visited New York last week.

Tennessee Centennial and International Exposition.

The occasion of the Tennessee Centennial and International Exposition is the end of the first century of the existence of the State of Tennessee. The idea of holding an industrial demonstration of world-wide scope has been under discussion in Tennessee three years, and the actual work of construction began in the Fall of 1895. With the erection of beautiful buildings, now well advanced, Tennessee deserves the distinction of being the first State to celebrate its admission into the Federal Union. The exposition will open May 1, 1897, for six months. The inaugural ceremonies will occur on June 1, 1896.

It has been decided that electrical effects will be one of the principal features of the exposition, especially at night. It was at first determined that there should be an electrical building, but the conclusion was afterwards reached that it would be more satisfactory all around to place the electrical exhibits proper in the machinery building and to produce the electrical effects in every part of the grounds. Mr. E. F. Seixas, who was an assistant in the electrical department at the World's Fair, and who practically had charge of the electrical exhibit at Atlanta, has for two months past been visiting New York and other eastern cities with the view of securing the most unique collections possible. Mr. Seixas's report will go to the director-general and to the Executive Committee, and his recommendations will go far toward deciding the exact nature of the electrical exhibits and effects.

The machinery building, in which the electrical exhibits will be located, will be 526 by 124 feet in size, with a boiler room 162 by 72 feet. The arrangement of the floor leads to three main entrances, marked by imposing porticoes, with six columns each, crowned by gables sculptured in high relief in appropriate designs. It is 68 feet to the top of the roof. The pulley room will be in the basement, on the level of the boiler room, with the exhibits above. The north end of the structure borders on the lake.

Jewell Pulley Covering.

The Jewell Belting Company, of Hartford, Ct., has issued a little pamphlet containing a collection of very strong testimonials on the merits of the Jewell pulley covering. To save the lost power due to the slippage of belts on pulleys, and at the same time to save the belts themselves, the bearings and oil that is unnecessarily wasted, the Jewell belt covering is in successful use in many of the largest mills and electric plants in the country. It is made of cement and a very heavy stretched canvas, the outer layer being of cement, which makes the drawing surface for the belt. It is claimed that it has been thoroughly tested under such varied conditions as to thoroughly demonstrate its practicability.

THE NATIONAL ELECTRICAL EXPOSITION.

A VALUABLE EDUCATIONAL EXHIBIT TO BE HELD IN NEW YORK NEXT MAY.

The indications at the present time are that the National Electrical Exposition, to be held in the Industrial Building, Lexington avenue and Forty-third street, New York city, from May 4 to May 30, inclusive, will be a great success. This will be the first exposition devoted exclusively to electrical and allied appliances which has been held in this country since that held in Philadelphia some years ago. Its object is to show the progress of electricity and its various applications. A large number of unusual and novel features will be presented, and a working exhibit covering the whole art from the generation of steam to the most modern method of illumination will be presented. The steam will be supplied for the engine exhibits free of charge, and both alternating and direct-current will be supplied at the cost of generating. The admission fee has not yet been decided upon, but it will be made extremely reasonable, so that every one will have an opportunity to attend.

The nineteenth convention of the National Electric Light Association, under whose auspices the Exposition will be held, will occur during the Exposition. The annual meeting place of the American Institute of Electrical Engineers has been changed from Chicago to New York, and this meeting will also be held during the Exposition. There will be band concerts every afternoon and evening. An important feature will be a series of popular lectures on electrical subjects, which it is expected will be very largely attended by the public in general. There will also be loan and historical exhibits of electrical apparatus, which it is said will be the finest ever placed on view. Mr. T. C. Martin, who has been for years a collector of historical electrical apparatus, is chairman of the committee having these exhibits in charge.

Arrangements have just been completed by which an abundance of power for operating every piece of working apparatus will be supplied. It is stated that the exhibit of boilers will be an unusually interesting and instructive one. The Edison Electric Illuminating Company of New York will make an exceptionally fine showing of the commercial applications of electricity, which will include many novel features.

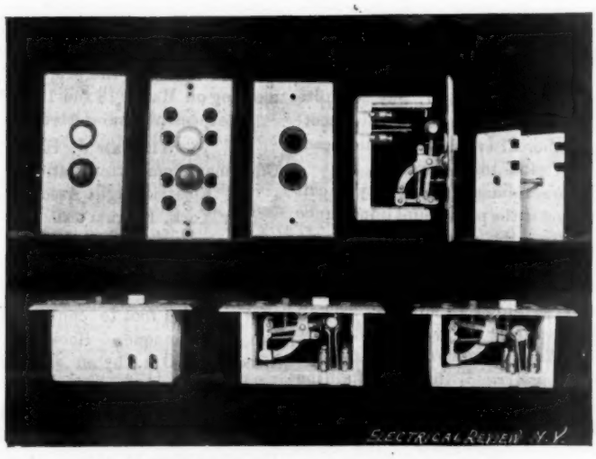
Up to date, 12,000 square feet of space have been contracted for by 150 exhibitors, and it is expected that these figures will be doubled before the exhibit opens. Mr. Clarence E. Stump has assumed the general management of the Exposition, and is handling the matter with his well-known energy and business intelligence. His offices at the present time are at 136 Liberty street, New York city. The allotment of space to exhibitors will be made on March 10. Before that time Mr. Stump will remove his offices to the Industrial Building, Lexington avenue and Forty-third street.

The educational value of an exhibition of this kind can hardly be over-estimated, and it is expected that the people of New York city and vicinity, as well as those from other parts of the country, will take advantage of the opportunity to view what has been done and is being done in electrical work. Several of the prominent railroads have already arranged to run special excursion trains at special rates to New York city during the Exposition, and it is believed that the attendance will be very large.

The Painter-Morrison Push Button Flush Switch.

The accompanying illustration shows in detail the Painter-Morrison push button flush switch, an ingenious device manufactured by the Morrison Southern Electric Company, Hoen Building, Baltimore, Md. Two of the strongest claims made for this switch by the manufacturers are its simplicity of construction and perfection of mechanism. The sides and base of the switch are of porcelain, making it fire and moisture-proof. It can be wired without taking it apart, thus saving labor and time. The finishing plate can be made to harmonize with the surrounding decorations and need not be attached until all other work is finished. The face plates are finished in brass, nickel, copper or any special finish desired.

These switches are double pole, of



THE PAINTER-MORRISON PUSH BUTTON FLUSH SWITCH.

10 amperes capacity and all parts are interchangeable. They are non-arcing, easily accessible in all their parts and may be placed in groups. The buttons indicate by the touch whether the current is on or off.

American Electrical Supply Company Fails.

Henry W. Gorton has been appointed receiver for the American Electrical Supply Company, of Buffalo, N. Y. The liabilities are said to be $14,000 and the assets $7,300.

Prof. William Conrad Roentgen.

The first announcement in this country of the discovery of the X ray and its effects was given in a special cable dispatch from London to the New York *Sun*, which was reprinted in the ELECTRICAL REVIEW for January 15, 1896. Since that time hundreds of American physicists and electricians have been repeating and verifying the original experiments of Professor Roentgen, of Würzburg. The scientific world has not been so thoroughly aroused for years over any discovery as it has been over these X-ray experiments. The daily and technical press have been filled with accounts of the work done in making shadow pictures with the X rays. Roentgen's name has become almost a household word in every civilized country. In spite of this fact little is known, in this country, at least, of the German professor's personality.

PROF. WILLIAM CONRAD ROENTGEN.

William Conrad Roentgen is of Dutch origin. He studied at Zürich with the well-known scientist, Kundt, and afterwards became his assistant. As professor and assistant, these two went from Zürich to Würzburg and from there to Strasburg. In 1875 Roentgen became professor of mathematics at the Agricultural College in Hohenheim. Four years later he was appointed a professor in the University Institute of Physics in Geissen. He returned to Würzburg in 1888 and has been teaching there ever since.

Professor Roentgen's published works comprise several valuable scientific treatises, including one on the use of the ice calorimeter to determine the intensity of sunlight, and another on a method to fix the isothermal surfaces of crystals. He has long been engaged in electrical research, and made a special study of the figures produced in dust by electrical discharges and the phenomena shown by electricity in passing through various gases. He has delved into nearly every branch of physics. He invented an aneroid barometer to tell the weight of the atmosphere and has also published a treatise on the theory and working of the telephone.

Considerable discussion has arisen as to the nature of the X rays. In this connection it is interesting to note Professor Roentgen's opinion of the matter as he states it in a paper recently published:

If one asks, what then are these X rays, since they are not cathode rays, one might suppose, from their power of exciting fluorescence and chemical action, them to be due to ultra-violet light. In opposition to this view a weighty set of considerations presents itself. If X rays be indeed ultra-violet light, then that light must possess the following properties:

1. It is not refracted in passing from air into water, carbon bisulphide, aluminum, rock salt, glass or zinc. 2. It is incapable of regular reflection at the surfaces of the above bodies. 3. It can not be polarized by any ordinary polarizing media. 4. The absorption by various bodies must depend chiefly on their density.

That is to say, these ultra-violet rays must behave quite differently from the visible, infra-red, and hitherto known ultra-violet rays.

These things appear so unlikely that I have sought for another hypothesis. A kind of relationship between the new rays and light rays appears to exist; at least the formation of shadows, fluorescence and the production of chemical action point in this direction. Now, it has been known for a long time that, besides the transverse vibrations which account for the phenomena of light, it is possible that longitudinal vibrations should exist in the ether, and, according to the view of some physicists, must exist. It is granted that their existence has not yet been made clear and their properties are not experimentally demonstrated. Should not the new rays be ascribed to longitudinal waves in the ether?

I must confess that I have in the course of this research made myself more and more familiar with this thought, and venture to put the opinion forward, while I am quite conscious that the hypothesis advanced still requires a more solid foundation.

The *Photographic Times* for March devotes quite a number of its pages to the important discovery by Prof. Roentgen. Mr. Max Osterberg, E.E., A.M., contributes an interesting article upon the subject, illustrated by some "skotographs," as he calls them, of objects inclosed in an aluminum case. Illustrations are also given of Prof. Wright's experiments with Roentgen rays, and a translation of the report of Prof. Roentgen himself. The rest of the issue is made up with some fine articles and illustrations.

Standard Rules for Electrical Construction.

To the Editor of Electrical Review:

On behalf of the Committee on Standard Rules for Electrical Construction and Operation of the National Electric Light Association, I take pleasure in sending you herewith a statement as to the present condition of the work undertaken by that committee for the forming of a joint committee, composed of the various electrical, insurance and allied interests, which joint committee, it is proposed, shall take up the most important matter of the codification, promulgation and enforcement of one standard set of rules which shall meet as fully as possible the conditions that now exist, be up to date and prove acceptable to the various interests affected by electrical construction work.

The following organizations were invited to co-operate, and our committee is most pleased to state that in every instance the invitation extended has been accepted, and in the appended list are given the names of the delegates appointed to represent these various organizations, and the character of the appointments made is, in every case, so high as to guarantee a most careful consideration of the important questions to come up and their treatment in an able and conservative manner. The list of those who have been invited to co-operate with our committee, together with their delegates, is as follows:

American Institute of Electrical Engineers, Prof. Francis B. Crocker, Columbia College, New York.

American Street Railway Association, John A. Seely, consulting electrical engineer.

National Board of Fire Underwriters, William H. Merrill, chief electrician, Chicago, Ill.

Western Union Telegraph Company, A. S. Brown, chief electrician, New York.

Postal Telegraph Company, Francis W. Jones, chief electrician, New York.

American Institute of Architects, Alfred Stone, secretary, Providence, R. I.

National Association of Fire Engineers, Capt. William Brophy, electrical expert of the Commissioner of Wires Department, city of Boston, Mass.

American Bell Telephone Company, C. J. H. Woodbury, of the engineering staff, Boston, Mass.

General Electric Company, Lieut. S. D. Greene, general manager lighting department, New York.

Westinghouse Electric and Manufacturing Company, Charles F. Scott, electrician, Pittsburgh, Pa.

The Committee of the National Electric Light Association, who have had charge of the standard rules of that association for a number of years, and who have taken the initiative in the forming of the Joint Committee, are as follows:

William J. Hammer, chairman, consulting electrical engineer, New York.

James I. Ayer, consulting electrical engineer, Boston, Mass.

Harrison J. Smith, general operating superintendent, Edison Electric Illuminating Company, New York.

E. A. Leslie, vice-president and general manager Manhattan Electric Light Company, New York city.

Capt. William Brophy, electrical expert of the Commissioner of Wires of the city of Boston, Mass.

In view of the various misconceptions of the Committee of the National Electric Light Association and of the Joint Committee, it will not be out of place to state that the various associations have been invited to send a delegate to the joint conference on March 18, but not in any way was it intended to commit them to any definite action at the meeting. It is purposed that the various rules which have been promulgated by the various interests, electrical and insurance, shall be taken up for consideration and thoroughly discussed from the standpoint of the various interests represented at that meeting, with a view of forming a new code, comprising the best that is in the various sets of rules now in vogue, and new matter considered advisable; that the delegates should take part in the discussion and vote upon the various matters which would come up bearing upon the importance and value of the rules submitted, and after a code has been prepared which has met with the approval of the various delegates attending the meeting, that the code thus prepared should be submitted by the various delegates to the bodies which they represent, with the intention that they shall ultimately, if it is deemed advisable by the various national organizations, be approved by them. And, as stated before, it is not the intention that the questions taken up in the discussion shall commit the various organizations to any definite decision in this matter at this meeting or thereafter, if they should deem it inadvisable to co-operate.

It seems almost unnecessary to call attention to the paramount importance of securing the adoption of one single set of standard rules. Examine the condition of things which exists to-day, in which we have the code of rules issued by the National Electric Light Association, which, as is well known, are largely the basis of all the rules used in the United States; the code adopted by the National Board of Fire Underwriters; the rules issued by the various illuminating companies; the rules of the Manufacturers' Mutual, of New England, and similar associations; the rules now about to be issued of the Fire Department of the city of New York, and similar organizations in other cities; the independent sets of rules prepared by consulting engineers, insurance experts, etc., which are more or less in vogue in the United States. Unquestionably, the existence of these various rules, which are all of them of greater or less intrinsic value and importance, lead to a tremendous amount of confusion, misunderstanding, expense, litigation, and, I think, will be generally admitted, frequently to the interpretation and enforcement of the various rules largely in accordance with the personal views of the local inspectors. By securing the adoption, promulgation and enforcement of one single standard which will meet with the approval of the various electrical, insurance and allied interests, and which rules shall be the result of the joint action of these various interests, and not be fathered by any particular association, electrical, insurance or otherwise, we shall arrive at a condition of things which has been hoped for and worked for for many years past. It seems, then, as the preliminaries for the proposed joint meeting have been so successfully inaugurated, that it is the duty of not only the various organizations which are co-operating at this joint meeting, but electrical and insurance men, and those connected with allied interests, to lend every assistance and encouragement in their power to secure the aimed-at and much-to-be-desired result of the adoption of a single national code of rules.

On behalf of the Preliminary Committee of the National Electric Light Association, who are arranging the details of the meeting which is to be held on March 18 (and probably on the 19th as well), I wish to extend an invitation to any one to send, either to my address or to Mr. George F. Porter, secretary of the National Electric Light Association, 136 Liberty street, any criticism or suggestion upon any of the rules now in vogue, or matter which might be included in the proposed new code.

In conclusion, I take pleasure in stating that the American Society of Mechanical Engineers have extended the courtesy of the use of their headquarters, at 12 West Thirty-first street, for the holding of the proposed joint meeting on March 18 and 19, 1896.

Respectfully submitted,

William J. Hammer,
Chairman Committee National
Electric Light Association.
New York, February 20.

OUR CANADIAN LETTER.

Brockville, Ont.—There is a movement on foot to connect Kingston, Gananoque, Rockport and Brockville, Ont., by an electric railway.

Lennoxville, Ont.—There is a good deal of talk in Lennoxville about the advantages of having an electric railway between that town and Sherbrooke, Que.

Galt, Ont.—All the work on the Hespeler, Ont., extention of the Galt, Preston & Hespeler line is now complete. Government Inspector Ridout went over the line on January 24.

Uxbridge, Ont.—The people of Uxbridge are listening to reports as to the possible failure of their electric railway scheme to go through, and they are wondering if they are liable for the second instalment on the subscribed stock in case it does not.

Rockton, Ont.—Rev. Dr. Burns and Engineer Power, who are promoting the electric road to run from Hamilton to Waterloo, held a meeting at Rockton, Ont., recently. The citizens are heartily in favor of the scheme, and, no doubt, "something will be done."

St. Catherines, Ont.—The Lincoln Radial Electric Railway Company is applying for a charter to build lines from St. Catherines to the villages of Jordan, Beamsville and Grimsby, with a branch to Smithville and to Port Delhousie, and also to Queenstown, with power to buy the Lincoln Street Railway Traction and Light Company, Limited.

Montreal, Que.—The Montreal Street Railway professes to have no desire to build a line up the mountain. They would only do so in order to prevent some one else doing it, and at the earnest request of the council, G. C. Cunningham, manager, says the line would cost $100,000, and as it would be open only four months in the year, the returns could not be such as to make it a profitable investment.

Montreal, Que.—The Berlin & Waterloo Street Railway is undergoing changes. The controlling interests, held by Mrs. Burt, of New York, have passed into the hands of W. H. and E. Carl Breithaupt. This will have a good effect on the road, as the new owners are citizens of the town and greatly interested in its progress. T. M. Burt and T. E. McLellan retain their places in the management, and E. C. Breithaupt is president.

London, Ont.—A St. Thomas gentleman is said to be negotiating for the purchase of the St. Thomas Street Railway, of London, Ont., from Hunt & Cameron. A price has been set on the franchise, and it is not unlikely that the road will pass into new hands on the 1st of March.

The Manitoulin & Pacific Railway Company is making application for an Ontario charter to build an electric railway from a point in Manitoulin Island to a junction with the Canadian Pacific Railway, between Sudbury and Algorna Mills, with power to operate a ferry or build a bridge at Little Current.

Cornwall, Ont.—Cornwall is to have an electric street railway. The contractors are W. Harper, of New York, and D. H. Starr, of Montreal. The contract was signed January 23, and tenders have been called for 2,000 cords of stone for the roadbed, to be delivered immediately. The contractors expect to have the cars running by the 1st of June. W. R. Hitchcock was the promoter of the scheme. A line is to be run from the Grank Trunk station to the Canada Cotton, Stormont Cotton, Cornwall Manufacturing Company and Toronto Paper Company's mills. The company will likely secure the Grand Trunk freight. The Town Council voted $500 yearly to the company to keep the road between the rails and 18 inches on each side of the rails in condition. J. A. C.

Montreal, February 20.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

Electric Light and Power.

ASPINWALL, PA.—Aspinwall Electric Light Company has been incorporated. Capital, $5,000.

GAINESVILLE, FLA.—It is reported that an electric light plant is to be established here.

AUSTIN, TEX.—The Nacogdoches Electric Light and Power Company has been incorporated. Capital stock, $10,000. Incorporators, R. C. Shindler, R. T. Shindler and C. I. Shindler.

PORT JEFFERSON, N. Y.—The Port Jefferson Electric Light Company has purchased a lot on Water street and will erect a brick building for a power house.

WAVERLY, TENN.—W. T. McCracken is negotiating with the manufacturers for an electric light plant. If he can make a satisfactory deal, this place will be an electric light town within the next few months.

GRANDVIEW, TEX.—J. E. Autrey is negotiating with Dallas electricians with a view to putting in an electric plant at this place.

ROUSE, COLO.—An electric plant is being put in at this place. It will be used as the motive power for the large pumps. Heretofore they have been run by compressed air. It is probable, too, that the electricity will be used to light the offices of the company and the Colorado Supply Company's store.

CANANDAIGUA, N. Y.—Canandaigua Electric Light and Railroad Company has been incorporated. Capital, $80 000; debts, $100,000; assets, $170,000.

BRIDGEPORT, CT.—The electric light company has now reduced the price of city lights from $102 a year to $95.

WASHINGTON, D. C.—The United States Electric Lighting Company has made an application to the commissioners for permission to construct an underground conduit on the south side of F street between Seventh and Fifteenth streets.

EDENTON, N. C.—Mr. J. E. White, of Hertford, has been contemplating for some time putting in this town electric lights.

GRAND RAPIDS, MICH.—The Grand Rapids Electric Light and Power Company has offered to sell to the city its plant used now for lighting the city, the consideration not being named.

MT. PLEASANT, IOWA.—An electric light plant will probably be established.

HOLYOKE, MASS.—Electric lights are to be established. The Committee on Fuel and Street Lights have petitioned the City Council for an appropriation of $40,000 to establish electric lights.

SALT LAKE CITY, UTAH.—Steps are being taken to establish a municipal plant.

FAIRGROVE, MICH.—An electric light plant is to be established.

PARSONS, KAS.—Parsons business men advocate the city owning its electric lights.

WYANDOTTE, MICH.—Wyandotte Electric Lighting Company's application denied for an injunction to restrain the city of Wyandotte from purchasing appliances to enable it to furnish lighting to its inhabitants.

MARYVILLE, MO.—The Maryville Electric Light Company will expend $10,000 in improvements to its plant.

BALTIMORE, MD.—The North Baltimore Improvement Company, which has a capital stock of $1,000 000, will establish an electric light plant, etc.

UNION, S. C.—An electric light plant is to be erected.

NEW ORLEANS, LA.—The Merchants' Illuminating and Power Company has been incorporated by J. J. Cohn and others to erect an electric lighting and power plant. Capital stock, $300,000.

LAWRENCEBURG, KY.—John McWilliams and others are interested in the construction of an electric light plant.

MONTGOMERY COUNTY, MD.—The Montgomery Power Company; Powell Evans, of Philadelphia, Pa.; H. T. Douglas, of Baltimore, Md.; R. L. Williams, of Richmond, Va.; Horace S. Cummings, of Washington, D. C.; have applied for incorporation. The company has the right to furnish electric, hydraulic or steam power. Capital stock, $15,000, with privilege of increasing to $100,000.

FORT VALLEY, GA.—Arrangements are being made to put in an electric light plant here soon. The project will be backed by Mr. W. L. Tatman.

MADISON, WIS.—Articles have been filed by the Appleton Electric Light and Power Company; capital, $50,000. Incorporators. A. L. Smith, J. S. Van Nortwick, J. M. Baer and L. E. Barnes.

HILLMAN, MICH.—An electric light plant is soon to be established here.

LOWVILLE, N. Y.—The Lowville Electric Light Company has under favorable consideration the advisability of purchasing another incandescent dynamo.

LITTLE VALLEY, N. Y.—Little Valley's new electric light system is now in successful operation. It is reported that about 50 per cent of the residents of the village will have their houses wired and use that system of lighting instead of kerosene.

PADUCAH, KY.—The city electric light plant is to be improved.

NEW LONDON, CT.—Walter Learned has received the plans and specifications of the proposed electric power house to be erected on Woodbridge street.

ROCKVILLE, MD.—The Montgomery Power Company bill has been introduced in the Maryland Senate, now in session at Annapolis, by State Senator Hattersly W. Talbott, to provide for chartering this company. The incoporators are Col. H. L. Douglas, of Baltimore; B. Y. Smith, of Harford County, Md.; R. Lancaster Williams, of Richmond, Va.; D. S. Mackall, of Fairfax County, Va.; Horace S. Cummings, of Washington, and Thomas R. Patton, Powell Evans and Henry L. Townsend, of Philadelphia. The company, whose headquarters must be in Montgomery County, Md., is empowered to furnish in Maryland, Virginia or the District of Columbia electric, hydraulic, pneumatic or steam power for driving machinery, lighting or heating.

BRIDGETON, N. J.—Bridgeton Electric Company has been incorporated by John Riley, Schenectady, N. Y.; Henry M. Francis, Brooklyn, N. Y.; Wm. A. Logue, Bridgeton; Edwin D. Mullen, Philadelphia. Capital stock, $25,000.

ELLICOTT CITY, MD.—Dickey & Sons, woolen mills, will establish an electric light plant in their cotton and woolen mills at Oella.

LONG ISLAND, N. Y.—Bay Shore Electric Light Company's stockholders, at its annual meeting held recently, voted to dissolve the corporation. The business is not in a prosperous enough condition to warrant the carrying on of it any longer. Lawyer Freeman L. Hulse has been appointed temporary receiver of the property and assets of the company, and the plant will continue to be worked for a time under his management.

HILLMAN, MICH.—Andrew Hanson will establish an electric light plant.

HOLLY BEACH, N. J.—An electric light plant is to be established.

BORDENTOWN, N. J.—The electric light plant has been demolished by storm. It will be immediately repaired.

PITTSBURGH, PA.—The German Savings and Deposit Bank, Carson street, will erect a new $100,000 building, which will require electric lighting.

JERSEY CITY, N. J.—A rumor is in circulation that an electric light trust had been formed in Newark by the People's Electric Light Company with a view to controlling the business in Northern New Jersey, and that the Jersey City and Hudson County companies had already been bought.

New Telephone and Telegraph Companies.

MANISTEE, MICH.—Manistee Electrical and Telephone Company has been incorporated with a capital stock of $50,000.

HANCOCK, MD.—The Tri-State Telephone Company, recently organized at Hancock, has now about 60 miles of wire in operation. The line extends to Berkeley Springs and to nearly all the main points in Fulton County, which, with the exception of McConnellsburg, the county seat, is without telegraphic communication. The line will shortly be extended to Mercersburg, Franklin County. A telephone exchange will be put in at Berkeley Springs.

DUNKIRK, N. Y.—The Lake Shore Railway Company will construct a new telegraph line between this place and Silver Creek. It decided to do this some time ago. The line which now connects the two places runs along the company's old tracks, which are now used by the Nickel Plate.

MILLHEIM, PA.—J. Spigelmyer, G. S. Frank, A. Walter, A. A. Frank and C. S. Musser, of this place, have applied for a charter for a corporation, to be known as the Millheim Electric Telephone Company.

MAGNOLIA, N. C.—It is reported that a telephone line will be put in between this place and Kenansville.

NEW HAVEN, CT.—M. J. Fahey, of this city, proposes to lay a telegraphic cable from San Francisco, Cal., to Juneau, Alaska.

NEW YORK, N. Y.—The Anglo-American Telegraph Company are in receipt of advices from London which report the opening of new telegraph offices beyond the frontier line of the British South Africa Company's territory, but telegrams are only accepted at the risk of the sender. The offices south of the Zambesi River are Beira Mazoe, rate $1.58 per word. The offices north of the Zambesi River are Blantyre Tchikwawa, at $1.64 per word.

BEDFORD, IND.—The new telegraph line over the Baltimore & Ohio branch of the Monon has been completed, and will be used by the railroad company and the Western Union Telegraph Company jointly. Offices will be established at Switz City, Bloomfield, Kolen, Owensburg, Bedford, Monon depot and the Bedford Western Union Telegraph office.

NEW YORK, N. Y.—An electrical signal system for the police department is to be established.

NORFOLK, VA.—The Southern State Telephone Company will soon commence putting in their underground system in this city and hope to be in operation by August 15.

New Electric Railways.

SHELBURNE FALLS, MASS.—It is not at all unlikely that the cars on the Shelburne Falls and Colrain Street Railway, which is to be built in the Spring, will be equipped with the storage system of electricity instead of using the trolley.

CAIRO, ILL.—Calvin V. Neff, representing the old stockholders, purchased the Delta Electric Railroad property for $35,000.

PALESTINE, TEX.—A petition has been presented by G. W. Johnson, of Palestine, from the Palestine Street Railway and Electric Light Company, a concern to be backed by Chicago capitalists, asking a franchise for a term of 50 years for the operation of an electric street railway and electric lights.

DALLAS, TEX.—The Dallas City Street Railway Company propose to erect a power plant.

CHEBOYGAN, MICH. — George Silsby, head of the rapid transit electric line between Bay City and Saginaw, is contemplating turning the street railroad line into an electric road and extending it to inland lakes.

SINGAC, N. Y.—An electric road will probably be constructed from Singac to Greenwood Lake.

PATCHOGUE, N. Y.—The Patchogue and Port Jefferson Traction Company has been incorporated with a capital of $400,000, to operate a street surface railroad 14 miles long between the villages of Patchogue and Port Jefferson, in Suffolk County. The company's principal office will be in Patchogue. The directors are: Joseph B. Swezey, Edwin Bailey, James R. Skinner, John B. Smith and Robert Palletreau, of Patchogue; Frederick C. Cochen, of Brooklyn; Orange T. Fanning, of Riverhead; Charles A. Tooker and Thomas O'Donnell, of Port Jefferson, and Frank Miller, of Bridgeport, Ct.

VINEYARD HAVEN, MASS.—The Vineyard Haven & Cottage Street Railway Company, of which Josiah Quincy, of Boston, is president, has been granted a franchise for its proposed electric road.

SANFORD, MICH.—An electric railroad is to be constructed to Edenville, with a branch to Hope.

PLAINS, MONT.—Steps are being taken to construct an electric system from Bonner to Missoula and from the latter city to Fort Missoula.

DENVER, COLO.—The South Platte Railroad and Power Company, incorporated by S. T. Smith, J. E. Rockwell, Norman Allen, George F. Dayton and J. H. Dayton, to construct a new electric road from Denver to Cripple Creek. Capital Stock, $1,000,000.

AYLETT, VA.—Steps are being taken to construct an electric railroad from Aylett to King William.

New Manufacturing Companies.

CHICAGO, ILL.—Chicago Electric Sign Company has been incorporated; capital stock, $10,000. Incorporators, E. C. Knowles, Walter S. Holden, Forest Hopkins.

NEW YORK, N. Y.—Direct-Current Transformer Company has been incorporated to manufacture electrical devices and install machinery; capital, $60,000. Directors, Alfred D. Warren, P. B. Welsh, W. A. Spellman, of New York city, and F. D. Goold and George Stanmore, of Brooklyn.

ROCKFORD, ILL.—Rockford General Electric Company has been incorporated; capital stock, $50,000. Incorporators, Merwyn C. Wheaton, Jesse Scribner, Godfrey H. Atkins.

MINNEAPOLIS, MINN.—The Bicycle Electric Light Company has been incorporated to manufacture instruments and machinery. The capital stock is $30,000. The stockholders, who also constitute the first board of directors, are W. H. Brown, Augustus Perrault and John Theis, Jr.

WARREN, OHIO.—The Packard Electric and Manufacturing Company has been incorporated. Capital stock, $110,000.

OSBORN, OHIO.—The Bio Chemical and Electro-Magnetic Company has been incorporated. Capital stock, $1,000.

CHICAGO, ILL.—Leschen-Macomber-Whyte Company has been incorporated; capital stock, $2,500; to deal in railway and electrical supplies. Incorporators, Frank E. Macomber, George S. Whyte and Henry J. Sampson.

NEW YORK, N. Y.—Barriett Armature Winding Company, electrical machinery, has been incorporated; capital stock, $10,000. Directors, William J. Quencer, Albert B. Quencer and Harold W. Shonnard.

Business Troubles.

BAY SHORE, L. I.—The stockholders of the Bay Shore Electric Light Company have voted to apply for a voluntary dissolution, as the business has not been prosperous. Freeman T. Hulse has been appointed temporary receiver, and the plant will be worked for a time under his management.

NEW YORK, N. Y.—Alexander S. Rosenthal has been appointed receiver for Herbert E. Rider, inventor, of 127 East Twenty-seventh street, on the application of Isaac Goodman. Mr. Rider was formerly in business at 918 Broadway. He is the inventor of an electric cigar-lighter, electric steam-generator, automatic envelope-opener and of an underground trolley system.

Increase of Capital Stock.

CINCINNATI, OHIO.—The Triumph Compound Engine Company has increased its capital stock from $75,000 to $125,000, and has filed an amendment changing its name to the Triumph Electric Company.

COLUMBUS, OHIO.—The Citizens' Light, Heat and Power Company has increased its capital stock from $200,000 to $500,000.

AN EASY METHOD FOR THE NEW PHOTOGRAPHY.

BY R. K. DUNCAN.

In Mr. A. A. C. Swinton's report of Roentgen's photography, he states that a sufficient excitation of the Crooke's tube is not obtained by direct connection to an ordinary Rhumkorff induction coil even of large size. I have obtained an easy method by which a sufficient excitation is readily obtained by an induction coil even of moderate size. The Crooke's tube should be one known as the stencil pattern, which has a cathode of aluminum about the size of a penny and a large anode cut in the shape of a cross, hinged, so that it may be let down out of the way of the cathode rays. This tube was devised by Crooke to show that radiant matter travels in straight lines. This is proved by the fact that when the cross stands upright there is a shadow of extraordinary sharpness of outline thrown on the end of the tube. The induction coil used is one of moderate size, whose primary possesses a resistance of 0.3 ohm. The make-and-break is accomplished mechanically by rotating a toothed wheel. The current used is an alternating incandescent light current of 52 volts potential and 16 amperes current strength. The number of alternations is 1,600 per minute. The alternating current is attached directly to the primary of the induction coil and the terminals of the secondary coil are connected to the Crooke's tube.

One might think that the number of alternations in the current itself would allow one to dispense with the mechanical make-and-break apparatus. The idea, however, is fallacious, for, on trial, no action on the plates was observed, although the tube was highly illuminated. The action of the tube itself is peculiar. At first it was found necessary to reduce the strength of the current going into the coil to seven amperes and to discontinue operations every half-minute on account of the intense heat generated. This effect, however, soon passed away, and we now put on the whole current strength of 16 amperes, sometimes for an hour at a time, without the glass becoming uncomfortably warm to the touch. The explanation may be that the glass now vibrates as a whole—that is, that the constituent molecules have adjusted themselves to harmonious relations with their neighbors.

That the glass is affected by the impact of the cathode rays may be readily seen in first using the tube. The aluminum cross comprising the anode is placed upright and the current turned on, making a shadow of the cross on the end of the tube. If, after continuing the current for a minute, the cross be thrown down, what was before the shadow now becomes much more brightly luminous than the surrounding tube. This shows that the tube may become tired, if one may use the expression, to the passage of the rays. This harmonious vibration of the glass, however, seems to do the tube good, for the necessary time of exposure continually lessens. Under the influence of the current the glass trembles to the touch and a small gale of wind apparently strikes the hand; only apparently, though, for experiment shows that there is no actual wind there. A person having his hand photographed generally states that he feels something going through his hand. The glass of the tube contains some fluorescent material which shines in spots with a greenish hue under the impact of the cathode rays. In the tube which we use the greatest fluorescence is situated at the very end, where the cathode rays strike normal to the surface. It is precisely this part which is most active in generating the X rays.

In order to take the shadow photograph the tube is placed end down about two inches above a plate holder containing the sensitive plate, covered tightly with a heavy ebonite slide. The object to be photographed—say a key, a coin or a pair of eyeglasses—is placed on the slide so that the rays strike it perpendicularly. After 30 minutes' exposure the plate is developed in the ordinary way and a positive image of the object upon the plate-holder may be seen upon the plate. The plate which we use is an ordinary No. 26 Seed plate, not the most sensitive, by any means, which we might have employed. After an exposure of 40 minutes the plate in the center may be made absolutely black.

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KINDRED INTERESTS

The Lombard Water-Wheel Governor Company, 61 Hampshire street, Boston, Mass., are sending out handy blotters of good quality advertising the Lombard water-wheel governor, which has a regulation of from one to three per cent.

Poetry and Paints—With the coming of each and every Spring, editors and publishers are offered "Spring poetry," which is considered by the authors of a quality quite equal, if not superior, to anything ever launched upon the poetry-loving world. As with poetry, so it is with paint—as the Spring season of painting and re-painting comes along there is sure to be offered something new in the way of paint mixture for the protection of roofs, ironwork, etc. Fortunately the public, as a rule, discriminate as wisely against such new nostrums as it does in its poetry, and rightly chooses a paint like Dixon's silica graphite paint, which has been so favorably known for over a quarter of a century. Roofs painted with Dixon's "silica graphite" paint have not required re-painting in 12 to 15 years and over. Railway and other corporations, known for their thorough testing and careful selection of materials, use this paint in large quantities. Any one desiring to know more about graphite paint should address the Joseph Dixon Crucible Company, Jersey City, N. J.

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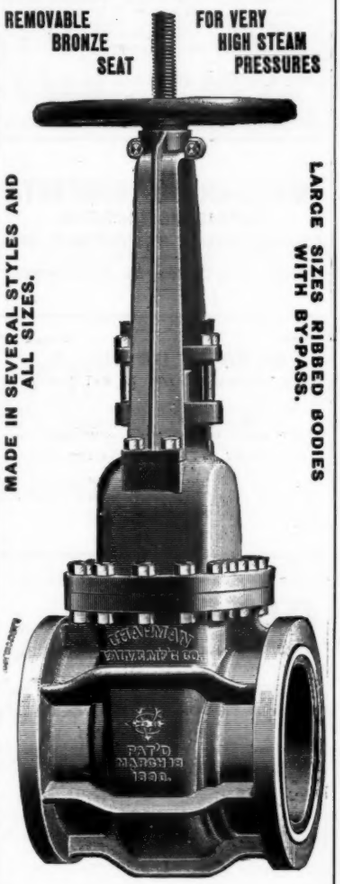

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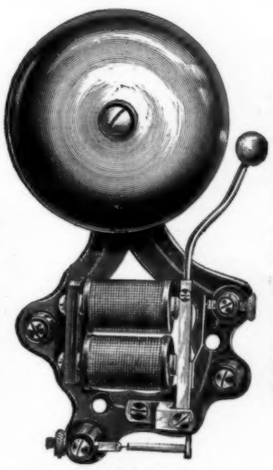

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ELECTRICAL PATENTS

ISSUED FEBRUARY 18, 1896.

554,656 Telephony; F. R. Colvin, New York, N. Y.

554,664 Means for supporting and insulating electric conductors; T. T. Eckert, New York, N. Y.—Consists of a metallic pin with a cap of wood, paper or other insulating material, the whole being covered with a casing of insulating substance.

554,665 Gas-lighting safety appliance; F. Englehard, Springfield, Mass.

554,670 Induction machine; W. E. Freeman, Fort Wayne, Ind.—Consists of a base and check pieces projecting upwardly therefrom, movable field pieces secured between said check pieces and an armature journaled between the movable field pieces.

554,671 Heat regulator; E. Frischenect, New York, N. Y.—A thermal circuit-closer for heat regulators and other purposes, consisting of a movable electric contact, means for moving the same upon a change of temperature, an adjustable contact having a metallic and an insulating portion, and conducting guides for the latter contact adapted to be connected with an electric circuit.

No. 554,716.—ELECTRICAL CONNECTING CORD.

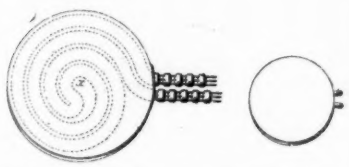
554,694 Trolley support; F. E. Homer, Cleveland, Ohio.

554,697 Lighting cars; W. F. Hutchinson, New York, N. Y.—Consists of a car and a revoluble screw on the car track, a generator on the car and a train of gearing connecting the generator with the screw.

554,716 Electrical connecting cord; C. H. McEvoy, Lowell, Mass.—An electrical connecting cord comprising two covered conductors, inclosed in a common covering and projecting from the ends thereof, and one or more suspension cords, arranged in said covering, the ends of said covering being turned in.

554,719 Conduit electric railway; W. Oesterlein, Cincinnati, Ohio.—A support for electric conductors embodying a supporting stem, a cup-shaped stand carrying the stem in suitable insulations and one or more shields surrounding the stem and covering the mouth.

554,723 Insulator; E. Peloubet, Alexander, Ark.—Comprises a base of metal with openings therethrough, one of which has a communicating slot and glass insulators in said openings.



No. 554,910.—ELECTRIC HEATER, RESISTANCE OR RHEOSTAT.

554,754 Bicycle training device; W. Webber, Pittsburgh, Pa.—A bicycle support, consisting of a pair of rear standards and a yoke pivoted to and uniting said standards, a diagonally-arranged clamp forming a central part of said yoke and adapted to engage with the bicycle frame.

554,759 Electric battery; C. Willms, Baltimore, Md.—Consists of a cell support of an electric battery, cells provided with enlarged supporting terminals and removable devices securing said terminals to the cell support.

554,760 Electric battery. 554,761 Electric battery and method of sealing battery cells; C. Willms, Baltimore, Md.

554,766 Electric clutch; T. A. Briggs, Niagara, Can.

554,795 Laundering apparatus; D. Reynolds, Evansville, Ind.—A wash-tub having the electrodes or terminals of an electrical supply attached to the handles.

554,818 554,819 Electric door-operating apparatus; O. H. Hicks, Chicago, Ill.—Consists of a door and its operating mechanism, an electric mat controlling the operation of said mechanism and divided into sections, one section being inoperative to control said mechanism in one position of the door and operative to control said mechanism in another position of the door.

554,821 Electro-magnet; J. Houlehan, Chicago, Ill.

554,836 Machine for connecting electric conductors; H. J. Savory, Somerville, Mass.

554,859 Rail bond for electric railways; R. C. Brown, Somerville, Mass.—A rail bond comprising a hollow plug inserted through each of the rails to be connected, and a tie wire extended through said hollow plugs and joined together at its ends.

554,862 Means for recording and reproducing impulses; W. H. Cooley, Brockport, N. Y.

554,868 Electrically operated railway track switch; F. H. Harriman, Hartford, Ct.—Consists of a reversible trolley pole, shafts carried thereon, a pinion, a gear sector connected to a crank arm, and a crank pin, and a slotted crank arm carried on a shaft.

554,884 Manually controlled electric block signal system; A. G. Leonard, New York, N. Y.

554,889 Fire-alarm telegraph system; J. F. Mehrens, Chicago, Ill.

554,895 Telephone; W. H. Russell, New York City. — A transmitting telephone having a resonant case, two vibrator-diaphragms mounted in the ends of said case, a cylinder extending centrally within said case, two cup-like carbons positioned within said cylinder and having their disk-like bottoms arranged face to face.

554,910 Electric heater, resistance or rheostat; P. E. Delany, South Orange, N. J.—Consists of a conductor having fireproof insulating buttons strung thereon in contact and constituting a continuous flexible insulation embedded or inclosed in a mass or block of refractory insulating material.

554,918 Electric circuit closer and breaker; J. R. Farmer, St. Louis, Mo.

554,926 Actuating mechanism for advertising devices; M. M. Gillam, New York, N. Y.—A rotatable sign carried on a shaft and an electro-magnet, an armature and a circuit making and breaking device for actuating said shaft.

554,949 Rail bond for electric railways; S. Nikoloff, Worcester, Mass.

554,955 Insulator for electric wires; M. Riera, Havana, Cuba. — Comprises two clamp members, one L-shaped and the other inverted L-shaped, so as to inclose between them a prismatical space, and an elastic filling held in the said space and apertured for the reception of the wire.

554,962 Electro-magnetic induction system of propulsion; A. C. Shuttleworth, Philadelphia, Pa.

555,028 Process of tanning and compound therefor; John H. Thompson, Columbus, Ind.—Consists in subjecting the hides or skins to a bath of myrobalans, sumach and water.

555,051 Telephone instrument; H. P. Pratt, Chicago, Ill.—Comprises a bent magnet having an annular pole piece on one end, and a pole piece provided with a helix and arranged at its opposite end, and the diaphragm provided with an armature arranged to extend through the space within the annular pole piece.

555,056 Galvanic battery. 555,057 Electric lighting system. 555,058 Galvanic battery; E. L. Slocum, Pawtucket, R. I.—A carbon electrode provided with a flange which rests upon the top of a jaw, a recess formed at one side to receive the zinc electrode, a central cavity, side openings, and longitudinal interior grooves.

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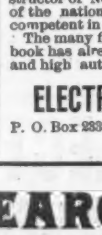

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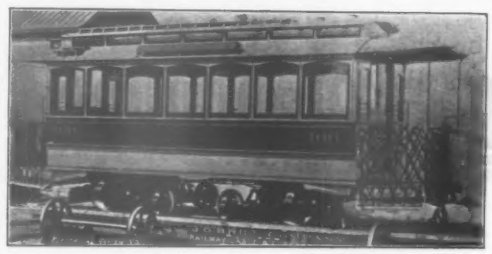

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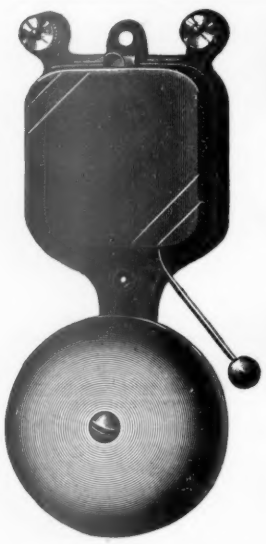

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